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CONTENTS.

An Asterisk (*) denotes an illustrated article.

American Gas Light Association..... 105
EDITORIALS—
The Future Position of Gas as an Illuminant..... 105
Gas for Heating in Paris, France..... 106
The Semi-Annual Meeting and Excursion of the New England Association..... 106
Obituary—Robert Briggs..... 106
Gas Light and Coke Company..... 106
The Action of Light on Oxygen..... 106
Semi-Annual Meeting of New England Association of Gas Engineers. 107
Gas Motor for Operating Carriages..... 110
An Electric "Leak."..... 110
The United Gas Improvement Company..... 110
Gas Exhibition at Brussels..... 110
*Coal Gas as a Heating Agent..... 111
New Mechanical Stoker..... 115
Adulteration of Cements..... 115
Gas Works in China..... 116
Naphthaline..... 116
Lighting the Harbor of Bilbao..... 116
CORRESPONDENCE—
Gas Purification..... 116
Quick Work..... 116
Utilizing Liquid Carbonic Acid..... 117

[OFFICIAL NOTICE.]

American Gas Light Association.

OFFICE AMERICAN GAS LIGHT ASSOCIATION,
No. 142 CHAMBERS ST., N. Y.

The Tenth Annual Meeting of the Association will be held in the city of Pittsburgh, Pa., on the 18th, 19th and 20th days of October, commencing at ten o'clock, A.M.

Members who intend to present papers at this meeting are requested to notify the Secretary of the titles of their articles, so that a programme may be arranged at as early a date as possible.

Parties desirous of becoming members can have blank applications sent to them by applying to the Secretary.

WM. HENRY WHITE,
Secretary.

THE FUTURE POSITION OF GAS AS AN ILLUMINANT.

We have always been among the foremost in pressing upon the attention of the gas fraternity the advisability of extending the use of gas for other than lighting purposes; but while doing so we have endeavored to keep prominently in view the fact that such departures should simply be regarded as valuable auxiliaries to our business, not its mainstay. Parenthetically we may mention that the value of these new branches of our industry will, speaking generally, be in proportion to the amount of attention they receive at the hands of the purveyors of gas.

But to return to the matter in hand, the supplying of gas for lighting purposes—this we have always held is to be in the future, as it has been in the past, the main purpose of the existence of gas companies. At the present day it would be preposterous to claim any novelty for the opinion just enunciated, for it is now generally held that, leaving out of consideration the auxiliary branches of the business to which we have referred, there is still plenty of room in the world for gas and all its rivals. This, however, was not the opinion commonly held a few years ago; for it was then the current idea hat gas, as a lighting medium, would soon be a thing of the past, and that the only excuse for the existence of gas companies would then be that they might afford the denizens of the cities a more cleanly and economical fuel.

But at that time the electric light warped the better judgment of those whose verdict would usually have carried with it great weight. Nor was this to be wondered at; for the reappearance of this new light was accompanied with such a great hurrah, that opinions and figures of electricians were at once accepted as true, and verdicts formed on them, instead of first inquiring into the soundness of the basis before giving utterance to prophecy. Now, however, as the electric light has been before the world for several years, it is possible to form a calmer opinion of its possible influence on the gas industry.

Even at the present day we find missing one important factor of the case, the cost of the electric light. Nevertheless, if we first turn to look at the past, our eyes become accustomed, as it were, to the light; then turning we can possibly see further ahead than we might otherwise.

One thing that cannot escape a calm observer is that the electric light made its appearance, or reappearance, at, for it, a very propitious time. Capital, inventive ability, and scientific knowledge had long remained latent, waiting for some favorable opportunity to arise so that their possessors might turn them to good account. The discoveries which had then just been made in other branches of electrical science had merely whetted the appetite, not satisfied it. Again, it cannot be denied that at a period a few years back gas companies were not held in high repute by the citizens at large, excepting possibly by those who were interested in one or more such concerns. It is not necessary now to inquire into the why or wherefore, let it suffice that the commonly held opinion, with or without reason, that the price of gas generally was too high, was a large factor in the case.

Thus it was that the electric light was ushered in at a time when the world was, as we have remarked on a previous occasion, ready to bid it welcome first and inquire into its merits afterwards. And this matter is of importance just this far, that people, when comparing the early history of gas and electric lighting, contrast the progress made by the new light with that which obtained during a similar period of the infancy of the older luminant; then, reasoning by analogy, it is claimed that the subtle fluid will the more quickly

become the general light than gas did. But this reasoning is plainly fallacious, for gas lighting was inaugurated at such an early period in the history of the civilization of the Nineteenth Century that its originators had to build up not only the industry in which they were immediately interested, but many other cognate ones. It is only necessary to refer to the history of pipe manufacture to make our meaning clear. On the other hand the electric light has come among us at a time when the mechanical arts are in a high state of perfection, when the scientific colleges of the world are constantly sending forth trained men who are only too anxious to find some new industry in which to engage, when capital is in great abundance. This much to make it clear why we decline to apply the same process of reasoning to the history of gas and electric lighting.

The important question is—has the new light diminished the use of gas for lighting purposes? The correct answer is, we think, a simple negative. Of course we are now alluding to the aggregate result, for there are isolated cases where so large a part of the public lighting has been handed over to the electric concerns that the gas company would not have been able to maintain the usual rate of increase in the send-out without fostering those branches of the business to which we have alluded. Taking it, though, all in all, the introduction of the electric light has begotten a demand for more light. Two burners are considered necessary now where one sufficed before, or one of five feet capacity supplants one rated at three feet. We find this fact to hold in all the walks of lighting. In street lighting, in the illumination of stores, and in private dwellings, the cry is for more light.

Then when we turn to look into the future, with the aid given us by a study of the past, do we find anything to presage the extinction of the gas lighting business? We think not.

Notwithstanding all that has been said to the contrary, electric lighting is still in an experimental state, and so it is impossible to determine the cost of this mode of lighting. We certainly will not place it too high if we say that the cost of it is two to four times that of gas. This being the case, it is obvious that just as soon as the novelty of the electric light wears off, its use will diminish rather than increase unless, perchance, some startling discovery is made in electrical science; while this is possible it must also be admitted that the gaslight is open to improvement. In fact we make bold to say that if the gas business had had the benefit of one-half of the inventive ability which has been given to the electric light during the last five years, the amount of illumination obtained from a foot of gas would have been increased fourfold. The regenerative burner and the incandescent gas flame ought to render us good aid in the future. As gas is now burned a large proportion of the energy of the flame takes the form of heat instead of light; if the incandescent light can be so perfected as to admit its being used for general lighting, it would be a great boon, as it would increase the light and decrease the heat given off by the gas. So it is that when we come to speak of the future we must give gas the benefit of possible discoveries if we are to accord the same advantage to other modes of lighting.

The natural advantages of gas are such as to make it a light that cannot be easily brushed aside. The light afforded by it is soft and mellow, advantageously contrasting with its dazzling would-be rival. It can be made to afford any degree of light desired from that of a rushlight to that of the electric light itself. These are advantages which, if properly put before the world, would command attention. True they have been dwelt on by gas journalists over and over again; but mere statements, unaccompanied by ocular demonstrations, carry little weight. The matter wants to be shown, not merely talked about, and the opportunity will shortly be afforded the gas fraternity of putting these advantages, which the mode of lighting in which they are so much interested possesses, before the world in visible form. We refer to the forthcoming exhibition to be held at the Crystal Palace, London. Before, the electricians had things all their own way and vied with one another in their endeavors to dazzle and mystify the visitors at the exhibition.

Now all this is to be changed. The two forms of lighting are to be placed in close juxtaposition. Surely, if the gas part of this novel show is managed aright, it will do more to dispel any doubts that may exist as to the future of gas as an illuminant than acres of writings. On the one hand the bright electric light burning without any degree of steadiness, and whose very cost is an unknown amount; on the other hand the soft gas lights, of all sizes and intensities, and whose cost can be readily given in dollars and cents, ought undoubtedly to result in a verdict in favor of the older luminant. If such is to be the case, if the result of the exhibition is to be to place gas lighting on a surer foundation, the gas industry in this country will be benefited thereby, as well as our trans-Atlantic friends, and we ought to contribute our share towards so desirable a result. We ought to give our friends abroad support in this matter morally and pecuniarily.

Finally, there seems good reason for holding that gas will remain the staple light. It must, however, be remembered that improvements in electric lighting, or the oil lamp business, must be met with corresponding advances in our industry.

GAS FOR HEATING IN PARIS, FRANCE.

For some time past the Paris Gas Company have been endeavoring to obtain an extension of the concession which they hold from the Municipality. This concession grants to the company the exclusive right to manufacture and sell illuminating gas to the citizens of Paris and its suburbs, subject to certain conditions, and the contract expires, by limitation, in 1905. The Paris company now desire to furnish gas for cooking purposes; but in order to do so, under the scheme which they propose to employ, it will be necessary to add largely to present capital for the purchase and construction of plant, etc. Before incurring this increased expenditure they found it would be essential to secure an extension of the present grant, so that sufficient time would be given to enable them to get an adequate return upon the new capital invested, and so made application for a renewal of the concession for a further period of forty years, from the year 1905. This has been agreed to by the Municipal authorities, the conditions being that the company shall reduce their prices to the following:

To private consumers, 25 centimes (about $1.45 per 1,000 cubic feet) per cubic meter, and 20 centimes for motive power, these prices to be continued until some future period, not yet determined, when half the profits are to go towards further reduction in prices to consumers.

THE SEMI-ANNUAL MEETING AND EXCURSION OF THE NEW ENGLAND ASSOCIATION.

The Semi-Annual Meeting and Excursion of the New England Association of Gas Engineers, with their ladies and friends, was held in accordance with the official notice previously published in our columns. The Secretary's report will be found in this number, and will prove interesting reading. The address of the President, A. B. Slater, Esq., of Providence, R. I., gave great satisfaction to his listeners, and with a commendable spirit of enterprise he has offered a money prize to be given to the member who will make the best pecuniary showing in working results for the last six months of 1882, as compared with the first six months of same year. From the report it will be seen that the Association enjoyed a most delightful trip, the only thing marring perfection being the illness of Mr. Taber, the venerable president of the New Bedford Gas Light Company. The report furnishes complete details.

Obituary.

ROBERT BRIGGS, C.E.

The gas engineers of the country will learn with sorrow of the death of Robert Briggs, C.E., whose demise occurred at Dedham, Mass., on July 24. Mr. Briggs was disabled by a stroke of paralysis about eight months ago, and, being about sixty years of age (having been born in Boston about 1822) never rallied from the effects of the first shock.

Mr. Briggs was a very able and accomplished gentleman, well versed in all engineering questions, and in the science of gas manufacture was looked upon as a leading authority in this country. He was for years connected with the Pascal Iron Works and the Southwark Foundry of Philadelphia, in which city he had resided for a long time. He was one of the prominent members of the Franklin Institute, and, for a short space, editor of the periodical published by that body. He was a very prolific writer, and often contributed to the columns of the JOURNAL.

Gas Light and Coke Company, London.

From the Semi-Annual Report of this company, for the six months ended June 30th last, it appears that the receipts from the sales of gas amounted to $5,025,000, and from sales of residual products, $1,312,000. The total receipts, from all sources, amounted to $6,453,753.

The total expenditures, for all causes, reached the sum of $4,439,569, and balance carried to net revenue account, as the gross profit for half year, was $2,014,184.

Coal carbonized during the half year, 643,068 tons; gas made, in thousands of cubic feet, 6,653,585; gas sold, in thousands, 6,212,388.

Residual products obtained in same period amounted to 739,132 chaldrons coke; 80,012 chaldrons breeze; 7,209,214 gallons tar; 179,330 butts liquor. The public lamps now supplied by the company number 36,932.

The Action of Light on Oxygen.

M. Dessaus is authority for the statement that oxygen is converted by the action of intense light into ozone. He has devised an apparatus for governing the admission of the radiations of a Drummond light into a jar of oxygen, and as the result of frequently repeated experiments, he affirms the fact of the direct transformation of the oxygen into ozone.—*Manufacturer and Builder.*

[OFFICIAL REPORT.]

Semi-Annual Meeting of the New England Association of Gas Engineers.

The Semi-Annual Meeting of the Association was held in Waite's Hall, New Bedford, August 16, 1882, and was called to order by the President, A. B. Slater, Esq., of Providence, R. I., who presided.

The reading of the record of the last annual meeting of the Association was dispensed with.

PRESIDENT'S ADDRESS.

The President then delivered the following address:

Gentlemen of the Association:—It has been said that man was conceived in pleasure and born in pain. The New England Association of Gas Engineers was conceived in pain, and, to say the least, our semi-annual meetings seem to have come to be more of the nature of pleasure excursions than earnest and active efforts to promote the business of gas manufacture, and placing ourselves in a position to furnish gas at the least possible rates to consumers.

This may seem somewhat critical; but the condition of things which leads me to say this is patent to every member of this Association.

The death of the late lamented Blake, of Worcester, was the occasion which brought us together and lead to the formation of this Association. Since that time such progress has been made that the product of gas per pound of coal has been largely increased, and the product per retort in some works more than trebled. I think I may say that much of this increase of results is due not simply to improvements made in machinery and apparatus, but largely to the impetus given by meeting together, comparing notes, and learning of each other, to say nothing of the papers read before the Association and the discussions thereon. One member finds that another works is producing certain results, and he is anxious to know the conditions by which it comes about—the why and wherefore; and these things continued for a series of years engender a little healthful rivalry, and never in the history of the business has it been more necessary to use every possible means of cheapening the cost of producing our gas than it is to-day.

In most places within a few years kerosene oil has become something of a competitor with gas, more especially among the poorer classes, who find it really necessary to curtail their expenses; and now electric light comes forward and claims a share of the business. To such an extent has this state of things obtained that some directors hesitate to spend money to extend and improve their works, so as to be able to meet any probable increase in the quantity called for. In my opinion such hesitation and doubt is short-sighted and unwise. We must be able to furnish the best quality of gas, and still at the lowest possible rates; and when we do that we need not fear that our business will decrease.

I believe it is true that where most electric light is used the increase in the sale of gas is greatest. Gentlemen, notwithstanding all competitors in the field of furnishing artificial light to-day, gas stands at the head, and there is little if any prospect of any rival usurping its place.

For safety, for convenience, for cheapness, all things considered—for a small light or a powerful one—gas still takes the lead. But the gas manager must not sleep at his post. He must be earnest, active, and alive to his own interests and to the necessities of the times; and this is why I say to you to-day that our semi-annual meetings must be something more than mere pleasure excursions. In order to maintain our position and hold the field, we must be able to sell gas cheaper; and to this end the cost of production must be lessened. And in this sense I welcome kerosene oil, the electric light, or any other competitor; for they have really done more to spur us to activity in our business than all other causes combined.

There was a time when few improvements were needed in the various kinds of machinery used in gas works, and the average gas engineer was apparently content if his ordinary caking coal yielded 3¼ to 4 feet of 12 to 14 candle gas, and 3,000 to 4,000 feet per retort; and the efforts of a board of directors in fixing the price of gas was confined to the arduous task of calculating the sum of 10 per cent. on their capital, and establishing a rate per 1,000 feet that would net the required sum.

Now we must have 5 feet of 16½ to 17 candle gas per pound of coal, and 11,000 to 12,000 feet per retort; and our efforts must be directed to solving the problem of selling gas so cheaply that the people cannot afford to use anything else.

A few years ago little or no gas was used for other than lighting purposes. Now it is used extensively for heating, cooking, and various mechanical purposes. It is a fact that comparatively few of the consumers of gas to-day are really aware that they can do all their cooking with gas much better than by any other fire; that a beefsteak can be broiled by gas much better than by any other fire, not excepting a charcoal fire.

I think it would surprise many of the directors of our gas companies, particularly to those who have given little attention to the matter, to see the various kinds and forms of gas stoves, ranges, etc., now in the market for cooking purposes as well as for heating. It is not too much to say that the officers of gas companies are remiss in their duty to themselves and to their customers if they do not take some means of bringing these things to the attention of the people.

Efforts should be made to reduce the cost of our gas by strict attention to all the details of manufacture, after extending and improving our works, so as to be able to obtain the best possible results, and thus be enabled to sell gas at a price within the reach of all for lighting, heating, cooking, and mechanical purposes, with a largely increased day consumption; and the time is not far distant when a coal fire in our kitchen will be looked upon as a barbarous thing of the past.

If such progress in the manufacture of gas and in the cheapening of its cost be made during the next ten years to come as has been made during the last ten or fifteen years, it is quite doubtful whether even kerosene oil will be much of a competitor.

There are many things to which I would like to call your attention; but it is not for me to take up your time, as our sessions at this meeting are somewhat limited, and I doubt not there are subjects which some members may wish for consideration and discussion.

I have only one thing to add. At the next annual meeting of the Association I would like to have as many members as possible show what saving, if any, they have been able to make in the cost of gas per thousand feet for the six months ending December 31, over the preceding six months ending June 30; this cost to be based on the cost of material and labor only, and the saving must be effected, not on any difference in value of material or price of labor, but on the working results brought about by improvements in apparatus or management, or both; and the calculations must be made on the equivalent values in candle feet, and the figures presented to the Association. To this end I offer a prize of $50 for the best showing, the prize to be awarded by the Executive Committee, or any special committee which the Association may select.

At the close of the address remarks were made by Mr. George D. Cabot, expressing his hearty approval of the sentiments embodied in the same, and especially of that part where the President offers a prize to the member showing the greatest saving in the manufacture of gas during the six months ending December 31, 1882, as compared with the six months ending June 30, 1882.

Voted, that the Secretary be directed to prepare a circular stating that such a prize had been offered by the President, and the conditions it would be necessary to fulfill in order to secure the same.

The Secretary stated that in consequence of the expense incurred for printing in book form the proceedings of the annual meetings of the Association in 1881 and 1882, it would be necessary to draw from the invested funds, and that to do so a vote of the Association was required, authorizing such withdrawal.

Voted, That the Treasurer be hereby authorized, with the approval of the President, to draw from the invested funds of the Association such a sum as may be required to meet the payment for the publication of the annual reports, and for such other expenses as may exceed the amount in the treasury derived from annual assessments and otherwise.

Mr. Robert B. Taber, in behalf of the New Bedford Gas Light Company, then made a brief address of welcome to the members present and their friends, after which he read the following paper on

GAS STOVES FOR COOKING AND HEATING.

I have been asked to say a few words with reference to gas stoves, their uses and practical advantages; but, at the outset, let me broaden my subject, because in the relation of the experiences of our company, although mainly the results of gas stoves and domestic operations, the increase of sales is, of course, not wholly to be credited to their account. In commencing, however, to ask your attention to day consumption I am reminded of a story told by Sojourner Truth, the negro revivalist, who being present one day at a meeting of the Sorosis sisters, in New York city, when the business of the meeting was the consideration of "Women's Rights," was called upon for a speech. Reluctantly rising, after repeated calls and almost urged forward to the steps of the platform, she faced the expectant group, and, in her powerful style, delivered the following: "Sisters, if you wants your rights why don't you takes 'em?" And, naturally enough, comes the conclusion if gas engineers and officers desire to take their rights in this matter of increasing their gas supply, just in proportion to their need or desire (I say need as well as desire advisedly in these days of competition), in that same proportion will it be necessary to give diligent attention to the sale of the heating powers of gaseous fuel.

Too much attention has, perhaps, been given to the manager's duty as a gas maker to allow his full development as a gas "drummer;" but in his intervals of leisure the genus "hated of all men" must act the part of "traveling salesman," and filling the office with dainty contrivances must

expatiate on the beauties of the kitchener, the delicacy of the flat-iron heater, besides keeping his eye well on the maker and the candle power. But, seriously, an era of good feeling between the much abused community and the adherents of the gas meter party will be none of the least of the advantages of a better acquaintance with the wants and wishes of consumers. And, short of giving the good people their gas, I am firmly persuaded nothing will do them so much good as showing them how to use it.

The merchantable value of heat from gas, then, is the side of our question in contra-distinction to its value as an illuminant. In what way is the value to be developed, and by what means can its use be made profitable to the consumer and to the company also?

The two methods of using heat now practiced, viz., the radiated heat from the open flame, and the direct heat of the Bunsen furnace, are now, it would seem, to be further intensified by hot air currents instead of cold ones. What the result of this change, modifying the circumstances in which the gas is burnt, may be in the future it were unwise to predict. Certainly a new field of labor opens when, by the aid of this new process Mr. Fletcher, of Warrington, can, with his little muffle, melt the most refractory metals, and it may be that, in this new application of heated currents of air to gas, the light and heat of our gas will find its true development. At present, as is well said, the peculiar use and economy of gas is applicable only to irregular and varying effects. Of intense energy, and particularly adapted to business uses by its readiness, cleanliness, and efficiency, nothing but unfitness on the score of economy should prevent its general adoption. Let us see who endeavor to use it. In the list given to the scientific students at Manchester, I find brazing, fractional distillation, melting of metals for stereotypers and plumbers, for the various uses of dentists, jewellers, hatters, spice factories, assayers, for tempering of metals and various experimental processes. Add to this list gas engines and, not least, gas stoves, both heaters and kitcheners, with the apparatus for laundry work, and the general list is complete. For special uses there are near every gas engineer, who searches for them, new instances of the application of intense controllable heat to intermittent work.

Now, confining ourselves to cookers and heaters, we may compare the different conditions under which this gas heat is sold—styles of makes as different as possible, and which have undergone a complete transformation in the past five years. The results of Mr. Hartley's observations, however, are not flattering to the heat economy of any of these.

Where 54 per cent. of the heat is wasted in a cook stove and less than ten per cent. of the energy developed by coal is utilized in a gas heater of the best pattern, and vastly less in others, there is an opportunity for American inventors which ought to be encouraged by those who are directly interested in the good results sought out. For, as is natural in so new a field, many of the American makes of gas stoves are extremely ill adapted to their purpose. The framework of many is unnecessarily heavy and expensive, in some extremely awkward, and based on generally wrong principles, and the price asked for them is often too high to allow of their becoming popular.

In the report of the jurors of the Glasgow Exhibition, as published in the *Journal of Gas Lighting*, I find their judgment in regard to the "points" of a good gas stove. They are worthy of notice as being the only authorized published statements. I should have been glad to have given you corresponding results to those they publish in regard to the working of samples of American stoves; but the short time at my command has prevented my making a sufficient number of tests to verify my conclusions. The report of the Glasgow commissioners was based upon the following conditions—

1. The economy of gas burned in proportion to size and cooking capacity of stove, together with heat converting power.
2. Cooking accommodation and workmanship in proportion to cost.
3. General convenience.

Each stove entered for trial at the Exhibition was submitted to the follow-tests:

1. Total amount of gas burned with everything in use.
2. Loss of heat by radiation to outside.
3. Gas consumed by ring burners.
4. Actual cooking test.

Could such a test be made by a committee of our Association of the various kinds of American stoves, their published report would, I doubt not, assist many of us in that delicate task of suiting at the same time the palate, the fancy and the pocketbooks of our consumers.

Of American cook stoves five ranges are made—Goodwin's, with open flame under the oven; American Meter Company, Sheldon Gas Stove Company, Gas Retort Stove Company and James L. Sharp, with the Bunsen burner. All of these make the boiling stove, as also McDonald, of Albany, the Novelty, of the Providence Gas Burner Company, the Old Dominion, of Burnham of Philadelphia, and Tift & Howard, of New York. These, with slight exceptions, complete the list. The extreme convenience of the open flame under the range oven partly compensates for its extra fuel cost. The absolute certainty of successful cookery guarantees the sale of the ranges in every place where they can be put, even at the increased price.

By making the oven self-supporting the Retort gas stove distanced its competitors in the boiling stoves with ovens, since the double oven of McDonald, while accomplishing the same purpose, is of doubtful utility. The rapid improvements in the past few years have, however, in all of these removed the trouble from acetylene odors. It is a rule now if there is any smell there is something untidy and wrong in the use of the stove; and if a steady, controllable fire is the thing sought after in the hot midsummer days, a fire which does not linger, is free from all dust and annoyance, at little cost, there is none other so well-fitted to supply the want as a gas stove.

For heating, however, no such full meed of praise can be given to any form yet patented. The different forms of the French "Cheerful" stove, with its flame burner, have been copied in various shapes, by Burnham, and Goodwin of Philadelphia, as also by Morton, the American Meter Company, and the Gas Retort Stove Company. Shaw, of Boston, in his stove now almost obsolete, made heaters with Bunsen burners, now followed by all the other American makers, but the condensing heaters of England are not seen in this country. As the consumption of one cubic foot of gas has been proved to vitiate 300 to 500 feet of the air of the apartment, the necessity of flue connection is apparent. These stoves, then, so far fail, as practically the call is for some heater to close rooms without chimnies, or to take the place of larger coal stoves, for neither of which purposes they are suited. Used with a flue, in an office, I have found the consumption of a Goodwin "No. 2," for ten hours a day, about 3,500 feet per month, and giving sufficient heat for a fair-sized room with southern exposure. Laundry irons and beefsteak broilers—this last one of the triumphs of gas cookery—are largely sought after, and the demand must grow as the knowledge of their comfort and convenience spreads.

There is no nursery can be without gas heat, and a well-directed effort of the gas engineer will find abundant methods of employing it, if only he can be convinced it will be profitable to his company. To this let me briefly turn and then I am done.

And, first, I object to any differential price for gas to heat consumers, believing it would end in confusion, preferring to sacrifice on the stove and its rental rather than on the price of gas. For the general experience of three years proves to me that a good stove, well set up, will satisfy the public without reducing rates. I allude to the setting up, for iron piping is apparently a necessity to ensure full day pressure, which it is impossible to obtain through a mohair tube.

A good rule is that an half-inch pipe will deliver fuel equal to two pounds of coal an hour, and no size of pipe smaller than three-eighths ought to be used. As to white rubber as an absorbent and radiator of gas odors this is unapproachable.

With regard to the system of rentals, conjoined with sales of the stoves, I unqualifiedly support it.

At Birmingham, England, I found Mr. Wood renting the gas stoves for the Corporation at rates which should reimburse him the full value with fair interest at the end of three years, and charging the rent on each quarter's bill. Practically, however, it is possible to do this at even lower rates, on account of the little depreciation which a gas stove suffers. So that on an investment of $2,000, or say 200 of different sizes and makers of gas stoves, rentals equaling twenty per cent. of cost would cover all the expenses, while the extra number of stoves at work, and consequent extra sales, will more than compensate any risk from the rental. I take from the average experience in our own works a gas stove will ordinarily consume more than 1,000 to 1,500 feet of gas per month. No consumer will object to such a fuel cost, while the sale of 300 thousand feet of gas per month, during our least busy months, is a valuable item. I find the increase in day sales varies this year from those of four years ago, when we first introduced the gas stove business, in the proportion of 100 per cent. as against 22 per cent. in the night sales, and that our present sales this year, in which we have 101 cook stoves at rental, besides twice as many which we have disposed of, equals twenty per cent. on our entire summer output. The heaters, of which the past winter we rented 30, consumed a much higher average of gas, when the varied uses for general day consumption for mechanical purposes, in the aggregate swelled the sum total to 10 per cent. of the entire yearly sales.

As to the objection from increase of loss as following the increase of pressure necessary to successful use in day consumption, I see no weighty objection. By Newbigging's rule the loss of six per cent. of unaccounted-for gas at one inch would be nine per cent. at two inches; or, since it is for the day-time only, it were not possible to add more than two per cent. extra for this extra loss, and this only in cost value in coal against 10 per cent. sold. Summing up, then, this rather lengthy plea for day consumption, the debtor and creditor accounts stand briefly as follows:

On the debit stands the item of the cost of advertising by exhibitions, newspapers, and all manner of means of enlightenment, one-half of which might also be charged to gas account to the advantage of general business, the interest on the outlay of, say, one stove to every three dwellings, with necessary depreciations of, say 10 per cent. of the capital invested, plus also

the loss of the extra day pressure of two per cent. make; and on the credit side a gain on sales of twenty per cent. in your least busy months, plus the still more important factor of a satisfied community. That it amply repays the expenditure is an absolute fact.

A very interesting discussion followed the reading of the paper, in which, among others, Mr. W. H. Price, President of the Cleveland, Ohio, Gas Light Company, took part. His remarks in relation to the introduction of gas stoves in his city, and the success which had attended his efforts in that direction, were listened to with great interest. He showed also that the use of gas engines was increasing in Cleveland, and that their use would be much more general were it not for their cost and the unavoidable delay on the part of the manufacturers in filling their orders for the same.

Mr. Tarbell, of Waltham, reported great success in the introduction of gas stoves for cooking in his district, and stated at considerable length and quite clearly the methods which he employed to bring them into favor, and consequently into general use in the community.

The consideration of the question of amount of pressure required to operate gas stoves successfully led to the subject of leakage of gas from mains and services, and that to the subject of street pressure, which brought out a surprising report of non-leakage from one of the members.

The President and Messrs. Price, Rollins, Cabot, and others took part in the discussion of these subjects.

Voted, That the thanks of those present be extended to Mr. Taber for his interesting paper.

The Secretary stated that a bound copy of the published proceedings of the last two annual meetings of the Association would be forwarded, on his return home, to each member; and that, upon request, he would furnish to any member an additional copy with paper cover.

Voted to adjourn.

After the meeting, carriages having been provided for the purpose, the ladies of the party had a very delightful ride through a pleasant part of the city.

In consequence of the threatening weather, the clambake which was to have been at Fort Phœnix, by invitation of the officers of the New Bedford Gas Light Company, was served in the spacious coke shed of the works of the Company. The interior of the building was tastefully decorated with flags and bunting, and a 350-candle Bray burner cast its soft yellow rays over the scene. It was scarcely needed, as there was sufficient daylight to enable the guests who were not overcome by the heat of the day or something worse to distinguish between the clam shells and their contents. But the very circumstance of a clambake in a gas company's shed, in New Bedford especially, would naturally create some uneasiness in the mind of the manager, and lead him to take proper precautions to be on the safe side in case of an eclipse of the sun, or some other equally alarming phenomenon. Nothing of the kind occurred, however, and the entertainment was highly enjoyed by the sixty guests present.

The distinguished visitor from Cleveland showed his limited experience of the manners and customs of civilized life when he confessed at the table that this was the first clambake he had ever attended.

The feast having been finished, the party, for an hour or so, sat on settees outside of the coke shed, or reclined on improvised seats on the wharf, or strolled about the works; and all agreed that that was coolest place they had found in New Bedford.

While the party was enjoying the coolness of the hour, a white object loomed up from the edge of the wharf, resembling in some respects a lighthouse when its snowy sides are bathed in sunlight. Upon investigation it proved to be nothing more nor less than the portly form of the member from Manchester, who, divested of outer coat, and resplendent in a spacious waistcoat of the purest white, was trying, as he had been that day and the day before, with indifferent success, to get cool.

A little before dark all returned to the Bancroft House, and retired more or less early or late to recruit for the next day's excursion.

The following morning, after an early breakfast, the party left the wharf in the steamer Monohansett, at half-past eight, for Oak Bluffs, Martha's Vineyard. The sail was very pleasant to all until, as the Steamer approached Gay Head, there appeared unmistakable signs of seasickness among the voyagers. The waves rolled higher and higher, and the epidemic seemed to be increasing in extent and power. So the order was given to change the course of the vessel and to sail under the lee of the island. Soon the afflicted ones began to improve; and before the arrival of the boat at Oak Bluffs all the party were in good condition with one or two exceptions.

Landing, the visitors spent an hour before dinner in wandering about Cottage City, visiting as many points of interest as possible in the time allowed them. At one o'clock they sat down to an excellent dinner at the Sea View House; but for lack of a sufficient number of waiters, the guests were obliged to wait—not on the table, but for their dinners; so that when th steamer's whistle sounded many were obliged to leave the table nearly as hungry as when they came to it. If the proprietor is desirous of economizing in the labor account, it might serve his purpose to employ, on a similar occasion a first-class gastronomic steam stoker to charge the guests with food, allowing, however, to those individuals whose capacities for absorption are unlimited, the use of scoops and shovels. After dinner heavy charges, by the ordinary method, would be in order at the office.

Soon after two o'clock the party went on board the steamer, and started on the return trip to New Bedford.

On the way the Association was called to order by the President; and it was voted that our thanks be tendered to the officers of the New Bedford Gas Light Company for their kind attentions and courtesies to the members of the Association, their ladies and friends on the occasion of this their semi-annual meeting and excursion.

A letter from the Westmoreland Coal Company, addressed to the President, inviting this Association to visit their mines, in company with the American Gas Light Light Association, at its Annual Meeting in October next, was read by the Secretary.

Voted to accept the invitation, with thanks.

In consequence of the limited time at the command of the Association, and their guests, they were obliged to decline the kind invitations extended to them to visit their manufactories, by the Wamsutta Mills, Edward Kilburn Agent, and the oil works of Messrs. Geo. Delano and W. A. Robinson & Co.

Voted, that our sincere thanks be tendered to the gentlemen extending the invitations and our assurances of regret at our inability to accept them.

After remarks by Messrs. W. H. Price, Clement A. White, Geo. D. Cabot and S. G. Stiness, the meeting adjourned *sine die*.

The steamer arrived at the wharf at 4:15 P.M., and the party went ashore, having sailed during the day a distance of sixty miles, and enjoyed a delightful trip. Soon all were on board the cars, on the way to their homes, which all probably reached in safety, as no report to the contrary has been received by the Secretary.

It was a matter of regret that, in consequence of his severe illness, the venerable President of the New Bedford Gas Light Company, William C. Taber, was prevented from meeting the members of the Association and friends on this occasion. He was one of the founders of the Association, was always much interested in its welfare, and is now by many years its oldest member.

It is the sincere wish of his friends in the gas fraternity that he may soon be restored to health, and that many more years may be added to his upright and useful life.

GEO. B. NEAL,
Secretary.

The following are the conditions which are to govern the award of the prize offered by Mr. Slater:

At the semi-annual meeting of the Association, held in New Bedford, Aug. 16, 1882, a prize of fifty dollars was offered by the President, to be awarded to the member who shall effect, at the works under his charge, the greatest saving in the first cost of gas per 1000 feet, during the six months ending Dec. 31, 1882, as compared with the previous six months ending June 30, 1882.

This saving must be based upon the cost of materials and labor employed in the manufacture of gas, and must not be due to any diminution in cost of materials per pound or quantity, or of labor per day, but to actual working results produced by improvements in apparatus or in better working of the same, or in more skillful management, or in all combined; the calculation of results to be made on equivalents in candle feet; the figures and results to be presented to the Association at its annual meeting in February next.

In order that the committee to be appointed to make the award may have the proper data from which to make their decision, reports of competitors should state clearly as follows:

1st—Quantity and cost of each kind of material used.

2d—Number of days' labor and wages paid for the same, including all labor in retort house, purifying house and exhauster room.

3d—Amount of gas produced.

4th—Average illuminating power of gas so produced, ascertained by daily observations with the bar photometer for each six months above named, made at a distance of not less than half a mile from the place of manufacture.

5th—Average number of retorts used.

6th—Percentage of coke consumed in furnaces.

7th—Pounds of coke used to carbonize 100 pounds of coal.

IRON MINERALS IN FRANCE.—The imports of iron minerals into France, in January this year amounted to 89,285 tons, as compared with 68,918 tons in January, 1881, and 58,399 tons in January, 1880. In these totals Spanish iron minerals figured for 31,252 tons, and 22,930 tons respectively.

Gas Motor for Operating Carriages.

The facilities now possessed for compressing gas appear to encourage the hope that gas engines may acquire a wide range of application. Gas engines acting by explosion as constructed at the present time, do not allow an automatic action, and are consequently not adapted to be used as locomotors in the same way as steam engines.

Mr. A. Montclair, of Paris, however, appears to have overcome the several difficulties in a satisfactory manner. The gas motors which he uses may be constructed on the Otto system, and they may be constructed single-acting, with one explosion for four half revolutions, or two double strokes of the piston, with one explosion for two half revolutions or one double stroke or otherwise, or they may be double-acting with one explosion for one, two, or more strokes of the piston. According to one arrangement the gas motor is arranged with a starting apparatus consisting of a supplementary compressed air-engine, which acts when required by friction or other suitable gear on the periphery of a fly-wheel. The gas motor may be of the ordinary construction, but by preference with two or more working cylinders with connecting rods and crank shaft as usual, the valves for the admission of gas and for the exhaust valves being operated by cams driven by shafts which are actuated by novel arrangements of gearing from the crank shaft. The slide valves for the distribution of air and gas and for ignition are operated by cranks and connecting rods. The gas stored in a receiver is conducted by means of a pipe to a box, from which it is distributed by two valves, acted on by cams, so as to admit the same gas alternately to the two cylinders. This box is furnished with a cock which can be operated by the driver by means of a lever in order to stop the engine or set it in motion. All these arrangements are similar to those employed in the Otto gas engine, except as regards the box mentioned and the novel arrangements in connecting with the shafts for operating the valves.

The crank shaft is provided with a sliding-clutch box, operated by a lever and handle for the purpose of connecting or disconnecting an eccentric with or from the crank shaft. This eccentric imparts motion to the piston of an air pump, which draws air into a receiver and compresses it. The air may be compressed during the journey, or preferably during stoppages, or while going down hill, and serves to actuate the air engine previously mentioned. The latter acts upon the circumference of the fly-wheel by means of friction, or other suitable gear, in order to diminish as much as possible the resistance to be overcome.

When it is desired to start the locomotor the supplementary air engine is caused to turn the fly-wheel of the gas motor three or four times until effective explosions are produced in the cylinders thereof, after which the air engine is disconnected from the fly-wheel and left at rest.

The compression of the air costs little, because its generation may be utilized as brake or resistance for effecting stoppages, or while going down hill. —*Iron Age.*

An Electric "Leak."

On the morning of Thursday, August 24th, one of the Edison conducting mains, situated in Nassau street, near Ann, New York city, became injured in some manner, probably through the carelessness of the laborers employed by the steam heating company engaged in piping the downtown district. The consequence was that an escape of the electric current occurred, powerful enough to be felt by horses passing over the street in close proximity to the spot where the fracture existed. The strange antics of the animals when first experiencing the shock, created considerable amusement for the bystanders.

A reporter of the New York *World* had the following interview with Mr. Edison in relation to the "leak"—

"In the first place," said Mr. Edison, "the report that it would be impossible for the fluid to communicate with the horses unless their shoes came directly into contact with some metal is all a mistake. The thing can be, and, in this case, has been done. The disturbance was directly due to a very simple circumstance. A service pipe had been laid from the main to a printing office in an upper story of a house in Nassau street, passing through a lager-beer saloon in the basement of the building. We had only got as far as the basement with our operations and the end of the pipe was left there, protected by a small metal cap. This cap, which had apparently not been properly screwed on, became loose and slipped on to the conductors, between which and the pipe enclosing them communication was thus established. The electricity, finding its way along the pipe, radiated in all directions in the earth, and a horse passing along the street near the base of the radiation, and forming part of what is technically called earth, would receive a shock sufficient to cause it considerable surprise, if not alarm. It was by some oversight, such as the most careful workmen are liable to, that electricity was in the service pipe at all, when we tested it yesterday we at once found a fault which it contained, for by our system we can locate faults with the greatest facility, and orders were given that it should not be connected with the machine. The branch, however, was supplied with electricity. But the force of the current that affected the animals was very trivial, equal to only some seven or eight cells of a common battery. Such a weak current could only affect the lower animals. All the steeplechasing that happened was simply due to the astonishment of the animals at the novelty of the sensation. At Menlo Park I have a electric railroad, and a horse crossing it will occasionally get a slight shock become scared. Yet a man can take hold of the rails with impunity. The electro-motive force is equal to 100 cells of a Daniell's battery, which would cause a pressure of 100 volts—a very low pressure, indeed."

"Had you much difficulty in setting matters right?"

"We just took the service tube out and disconnected it. You see it here."

Mr. Edison pointed to a short piece of iron pipe about three inches in diameter, containing two copper rods insulated from each other by means of an asphaltic compound. At one end was a flat iron box containing a quantity of the compound, and which Mr. Edison explained was used for making the connection between the service pipe and the main. The size of the conductors vary according to circumstances, the main conductors being equal to a copper rod half an inch in diameter, and the service conductors to rods of a smaller size."

"We were rather surprised at the very successful insulation we obtained by repeated experiment," said Mr. Edison. "We calculated that a certain length of pipe having a certain leakage, a hundred times the length would have a hundred times the leakage. We found, on the contrary, that by the use of one compound the insulation was in the ratio of no more than three to one. We tested three and one-half miles last night and the insulation amounted to 2,800,000 ohms, which is unprecedented for the size of our work and the necessarily rough and practical character of our machinery. Of course, compared with things like the Atlantic cable, the insulation is nothing extraordinary, but the instruments used for those purposes are of the most delicate and refined type."

"Do you expect soon to have your works in active operation?"

"Well, we are ready to go to work now, if the company pleased; but at present we are cutting in, and so on. I suppose in ten days we shall have 4,000 lights cut in. 'Cutting in' means establishing communication between the house and the main pipe. In the Nassau street district we have 1,100 service pipes, and about fourteen miles of pipe altogether. The district comprises 946 consumers. There are 14,311 lamps to be used in connection with these wires."

The United Gas Improvement Company.

A combination of capitalists of Philadelphia and New York has been formed under the name of the United Gas Improvement Company. This concern has purchased, and merged into one interest, the patents and rights of the National Petroleum and Water Gas Company of New York; the Elkins Manufacturing and Gas Company of Philadelphia; the Lowe processes, and several other systems. It is the avowed intention of the new combination to purchase, lease, or build gas works wherever it can be done to advantage.

It is asserted that recently a committee representing this concern offered to purchase or lease the Philadelphia Gas Works, on a basis of twelve million dollars, and materially reduce the price of gas; which proposition, it is said, is still under consideration. They claim to have contracts for the construction of works in New Orleans, Savannah, Kansas City and Reading, besides having control of works, already in operation, at various other points.

The following named gentlemen are the officers of the company:

President, John L. Stuart; Secretary and Treasurer, John T. Bodine; General Manager, W. W. Gibbs; Consulting Engineer, T. S. C. Lowe.

Gas Exhibition at Brussels.

Most strenuous efforts are being make in Europe for the purpose of showing to the public the utility of gas as a heating and cooking agent, as is manifest from the numerous exhibitions of appliances for furthering this end already held, and the number of new ones being projected. One of the latest of these is that now in progress in Belgium, and which (having opened on the first of August), is to last until the first of October. The Exhibition is given under the auspices of the "Association des Gaziers Belge," acting for the Municipality of Brussels.

Gold and silver medals, diplomas, etc., of a total value of 4,000 francs, are to be awarded to the exhibitors who rank highest in excellence and merit. Mr. M. H. Aerts, Manager of the Brussels Gas Works, is President of the Committee.

WITE SPIRIT VARNISH.—Rectified spirit, one gallon; gum sandarac, 2½ pounds. Put these ingredients into a tin bottle, warm gently and shake till dissolved. Then add a pint of pale turpentine varnish.

[From the London "Journal of Gas Lighting"]

Coal Gas as a Heating Agent.

A paper read by Charles Hunt, M.I.C.E., at the meeting of the Gas Institute, Birmingham, Eng., Wednesday, June 14, 1882, with the discussion thereon.

Although the heating property of coal gas, as ordinarily manufactured for illuminating purposes, has long been recognized, it is only within the last half dozen years or so that the possibility of its general application as a heating agent has been seriously entertained. The time lost, however, is being made up with increasing rapidity, and an almost continual succession of novel applications bears most satisfactory testimony to the kindly disposition of the public toward the use of gaseous fuel. An additional stimulus in this direction has recently been imparted by the influential movement set on foot in the Metropolis for the abatement of smoke, not the least important outcome of which has been the independent recognition of the merits of coal gas; while at the same time prominence has been afforded to other methods for the production of gaseous fuel. Whether these latter are entitled to serious regard may well be doubted, since the case for the establishment of a separate supply of heating gas is, in the essential element of comparative cost, less strong to-day than it was eighteen years ago, when an abortive attempt was made by Dr. Siemens and others to confer upon Birmingham the questionable benefit of a divided service. But "history repeats itself;" and the attractions of a low initial cost are, to the minds of many, again powerful enough to divert attention from objections that, when fully considered, will be found fatal to any scheme that has hitherto been, or perhaps can be devised. Ordinary "producer" gas, containing only about 30 per cent. by volume of combustible gases, and possessing a calorific value equivalent to about one-eighth that of 16-candle gas, is admittedly out of the question for the purposes of distribution; but it is sanguinely thought to be otherwise with regard to the more concentrated heating gas which it is possible to manufacture by means of one or other of the recently introduced modifications of the original Siemens producer.

Water as a limitless source of fuel has long been a favorite idea with the unthinking, or with those who think within a narrow compass; and the claims of water gas have been repeatedly advocated by a class of inventors more ingenious than practical. But the fact remains that no economy has ever been shown to attend the expenditure of fuel necessary to promote the required decomposition. It is "change for a shilling," with a liberal deduction for the accommodation; the practical result of the operation being the partial reproduction of the fuel in another form—that of hydrogen gas. When, however, this is combined with the gasifying of coal or coke, there is a prospect of advantage which may, for some purposes, counterbalance the lack of economy in the process; since the dissociated hydrogen takes the place, to a certain extent, of nitrogen that would otherwise be derived from the air necessary for combustion, and thus a highly combustible gas takes the place of one which is merely diluent. In this way a more concentrated fuel has been produced; in value, however, not exceeding at best that of 16 or 17 candle gas. Still it is evident that a fuel of such a fairly high power should be widely applicable, were it not that the cost of its production is more than proportionate to its enhanced value; being, according to the statements of its promoters, something like six times that of ordinary producer gas, or from 2½d. to 3d. per 1,000 cubic feet. Members are in a position to contrast this with results of their own assured working; and it is very questionable whether, keeping in view the difference in heating power, any considerable amount of uneasiness is likely to ensue.

It is, however, chiefly in the matter of distribution that the disadvantages of a purely heating gas become conspicuously apparent. It is not to be expected that more than a minority of the customers of existing undertakings would become patrons of a second supply; and therefore a greater proportionate mileage of mains would be required. And not only so, but the entire distributory plant would have to be of a much greater capacity; since, according to the most favorable estimate—which it is not contended has ever been continuously realized, or on a sufficiently extended scale—at least two feet to one would have to be distributed. Ample storage would also be needed, although with respect to the proportion that this should bear to the manufacture, there is room for difference of opinion.

We who are familiar with the inevitable costliness of distribution, and with the large capital outlay required on account of it and for storage, as compared with that which suffices for manufacturing purposes only, cannot fail of being impressed with the hopelessness of competition under any such conditions. If, however, it be objected, as with some show of reason it might, that existing undertakings have, for the most part, to bear the burden of capital unremunerative because it is unrepresented by actual value of plant, from which newer enterprises would be free, the answer is that the former have accumulated experience along with their capital, which it is open to them to profit by, and undertake a new departure.

In a recent report to his Committee, bearing evidence of a thorough conception of the subject, Mr. H. Woodall has shown that it is possible to supply illuminating gas at a price that should preclude all idea of competition from whatever source. Probably Dr. Siemens, who is no advocate for water gas, but who holds views of his own with regard to the practicability of a separate supply for heating purposes, would be the first to acknowledge that the desirability of his proposal ceases—its aim being more than fulfilled—with the establishment of the fact that illuminating-gas, manufactured by recognized methods, can be supplied to the consumer at a price not exceeding that which has been fixed as a reasonable one for a purely heating gas.

From an economic as well as from a scientific point of view, the complete gasification of coal compares unfavorably with what is called destructive distillation; producing as it does a fuel of comparatively feeble power, yielding no residuals by ordinary methods, and necessitating a loss—represented by the heat radiated from the furnace and carried off by the resultant gases—of not less than 30 per cent. of the calorific value of the coal. On the other hand, the actual loss in destructive distillation, being the fuel employed in heating the retorts, need not exceed 18 per cent. by weight; while the remaining residuals—coke, tar, and ammonia—cover from 60 to upward of 100 per cent. of the cost of the coal. It is, of course, possible to buy gold too dear; and this advantage may be the result of a greater proportionate expenditure for labor, wear and tear of plant, etc.; but after making sufficient allowance for this, it will still appear that destructive distillation is the superior process. These considerations, coupled with its facility of distribution, entitle illuminating gas to be regarded as the only practicable, because the most economical, system of gaseous fuel.

None the less vital, however, is the element of cost. The movement for a separate supply, as variously represented, is chiefly noteworthy as evidence of a demand which remains substantially unsatisfied from existing sources. Its meaning is that, however much to be desired, illuminating gas is too expensive to be commonly employed as fuel; and thus is indicated a condition somewhat novel to their later experience, with which its purveyors are confronted when seeking to extend their business in this direction. The manufactured article has to be submitted to competition with the raw material, the latter costing variously from 7s. to 21s. per ton, and the former upward of six times as much, as shown by the annexed table:

16-Candle Gas.

Number of Cubic Feet per ton (sp. gr. say .450) 65,000.

Theoretical Calorific Value, as compared with Coal, represented by the approximate equivalent evaporative power of each; Coal being taken as 14.5. Gas 22.5.

Quantity of Gas Cubic Feet.	Rate Per 1,000 Cubic Feet.	Amount Per Ton.	Amount reduced according to proportionate Calorific Value. Per Ton.
	s. d.	£ s. d.	£ s. d.
65,000	1 0	3 5 0	2 1 10.6
65,000	1 6	4 17 6	3 2 10.0
65,000	2 0	6 10 0	4 3 9.3
65,000	2 6	8 2 6	5 4 8.6
65,000	3 0	9 15 0	6 5 8.0

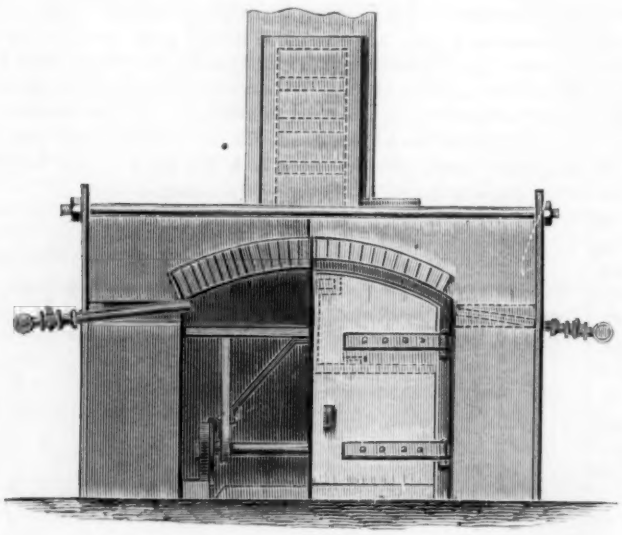
Coal for manufacturing purposes costs variously from 7s. to 22s. per ton, according to locality.

It is true that for a considerable number of purposes, chiefly domestic, a growing luxuriousness of habit, occasioning cost to be regarded as a secondary consideration, is on the side of gaseous fuel; and also that the convenience of a constant supply is felt to be well worth paying for. But it is none the less manifest that either this great disparity of cost must largely disappear, or else some more distinctly compensating advantage be made apparent, if the predictions alike of the friends and the enemies of illuminating gas are to any extent to be realized. Fortunately it is almost daily becoming more and more possible to satisfy both conditions. With regard to the first, and perhaps most important of these, since cheapness inevitably promotes consumption, increased value of residuals, greater economy in manufacture, improved appliances, and, though last, by no means least, a more judicious expenditure of capital, are, each of them, powerfully contributing to the general effect—a gradual diminution of the cost of production. The last named, in an especial degree, so tends to enhance the profit upon new business that Mr. Woodall, in the report to which reference has already been made, has been tempted to constitute it the basis of a proposal for encouraging the use of gas for trade purposes, which at least possesses the merit of novelty. Few can doubt the substantial accuracy of the calculations advanced by the promoter in support of his scheme, nor that the rate which he proposes should be charged—namely, 14d. per 1,000 cubic feet—would leave little to be desired; but so grave a departure from ordinary procedure as is involved in the proposition seems to require more justification than has hitherto been offered in support of it. It can scarcely be politic, or even just, to defer to the uses to which a commodity may be applied, to the ex-

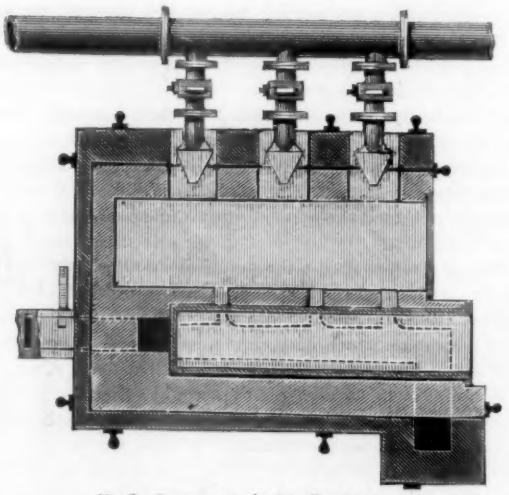
tent of varying its price according to such uses; while the offer of a preponderating advantage to a few, such as is contemplated by the scheme, is in contravention of the principle, hitherto upheld by common consent, of division of economies amongst the consumers, without regard to or distinction of classes or interests. Mr. Woodall acknowledges the claims of those who have "borne the burden in the heat of the day," to the extent of securing to them a profit of 3d. per 1,000 cubic feet upon the new consumption; but this profit is subject to a preferential charge, represented by the loss which must accrue from the reduction, of 6½d. per 1,000 cubic feet, to be effected upon all gas at present used for trade purposes. This loss, like the drawback upon silver plate, may be described as an almost unsatisfiable quantity, the very uncertainty of which is strongly objective to the proposal. More reasonable would it seem to offer a proposal in the shape of a substantial reduction for all increase of consumption from whatever source, although, for the avoidance of complication, it will be found more satisfactory to rely upon the continually recurring ability to concede reductions of price all round; for these, affecting all needs alike, act and re-act, with an unfailing tendency, to bring gas within the reach of every reasonable requirement. Nor need it be altogether a matter for regret that the most ardent wishes for the advancement of gaseous fuel cannot be swiftly realized. Knowledge is at best but slowly acquired; and it will be generally conceded that in the application of gas for heating purposes very much has yet to be learned.

Apart from its smokeless character, in which respect it is not singular, the claims of gaseous fuel rest upon its convenience, its facility of control, and the possibility (under proper treatment) of its almost complete utilization. These, in view of its greater cost, indicate to a large extent the uses to which it may be satisfactorily applied. Mr. Fletcher's furnaces illustrate in a remarkable manner the superiority of gaseous over solid fuel where great concentration of heat within a limited space is required; performing, as they can be made to do, the most difficult feats, including the fusion of nickel, with an ease, celerity, and even cheapness, almost unapproachable by other means. It may be said that these cannot in any material degree assist the general consumption of gas, by reason of their limited scope; but it must be remembered that it is only by such small uses that a consumption for heating purposes can in the first place be established. The most hopeful and satisfactory commencement must be with those uses, individually insignificant though they may appear, in which the peculiar adaptability of gas is most likely to triumph over the disadvantage under which it labors in the matter of cost. Economic principles, once established in the laboratory or workshop, find their way to wider applications. A recent example is afforded by the gas-kiln introduced by Messrs. Thompson Bros., of Leeds, and publicly exhibited for the first time at the Smoke Abatement Exhibition at South Kensington in January last. Its uses are, as is well known, for burning pottery, stained glass, etc., and for annealing or bending glass. These require a heat varying according to the nature of the work performed from 1,000° to upward of 2,000° F.; and it is essential that contact with sulphurous fumes or dirt be absolutely guarded against. It is almost unnecessary to say that these conditions are satisfactorily complied with, as evidenced by the extending favor with which the kiln is regarded by those in whose interests it has been devised. I have seen it in operation at two or three glass manufactories in the Metropolis, one of them being that of Messrs. Powell & Co., of Whitefriars, where I was informed that a single firing by the old method of a muffle heated by solid fuel occupied an entire day; whereas the kiln could in the same period be fired no less than six times. The saving of time thus effected constitutes a most important advantage, as the various colors used in glass staining have to be separately burnt in; thus frequently involving a series of operations for a single piece of glass. But the saving in labor is not less conspicuous; while it is also remarkable that the cost for fuel not only shows no increase, but is in every instance somewhat less. As shown by the drawing No. 1, the gas is introduced into the furnace on each side by means of a series of Bunsen burners placed in a slightly inclined position; dampers in the flues being employed to control the heat.

Analogous to it is the furnace that has been devised by Mr. W. S. Sutherland, of Birmingham. The accompanying drawing (No. 2) is a sectional plan of one in actual operation at a works in Birmingham, where it is used for annealing gold and silver; and great satisfaction is expressed with regard to it, not only on account of its cleanliness, and of the regularity with which it enables the work to be performed, but also because of its positive economy. The astonishing statement has been made to me by the user that whereas, with his former appliances, the coals consumed amounted to 6½ tons per week, costing 45s. 6d., the new furnace has only cost for fuel, during an entire twelve months' working, £21 15s. (exclusive of wear and tear of plant), being at the rate of about 8s. 6d. per week, or less than one-fifth of the former cost. It should be explained, however, that the gas used in this case is not illuminating, but "producer" gas, manufactured by a method also devised by Mr. Sutherland, a description of which would be highly interesting, but is foreign to the present purpose, which is to ascertain, as far as may be, the most economical mode of applying gaseous fuel. Whether the latter



No. 1.—Thompson's Gas Kiln.



No. 2.—Sutherland's Gas Furnace.

be of one kind or another can be of little moment, the conditions being so nearly identical.

Now, it is noticeable that in both these furnaces there is practically the same plan of introducing the gas. Mr. Sutherland, having mixed his air and gas beforehand, applies the mixture under pressure, through a kind of *tuyere*, which takes the place of the Bunsen burner. In their effect, also, there is an equally decided similarity; and it is this to which attention may be profitably directed. On placing a thermometer beyond the dampers in the outlet flue of a Thompson furnace, the temperature within which was a dull red, judged to be about 1,000° F., the utmost heat registered was 360° F. A similar observation made with a Sutherland furnace resulted in are corded heat at the outlet of 530° F.; the temperature at the same time within the furnace being almost of a cherry red, or say 1,200° F.

These effects, when placed in contrast with the results obtained with furnaces actuated by chimney draught, whether of the ordinary kind or such as are employed in conjunction with the "regenerative" system, afford an indication of the means by which economy may be secured. To go no further than our own retort houses, everyone knows that the escaping heat from the benches cannot be much, if any, less than the temperature of the retorts themselves; the loss resulting from which it is the object of the regenerative system to minimize.

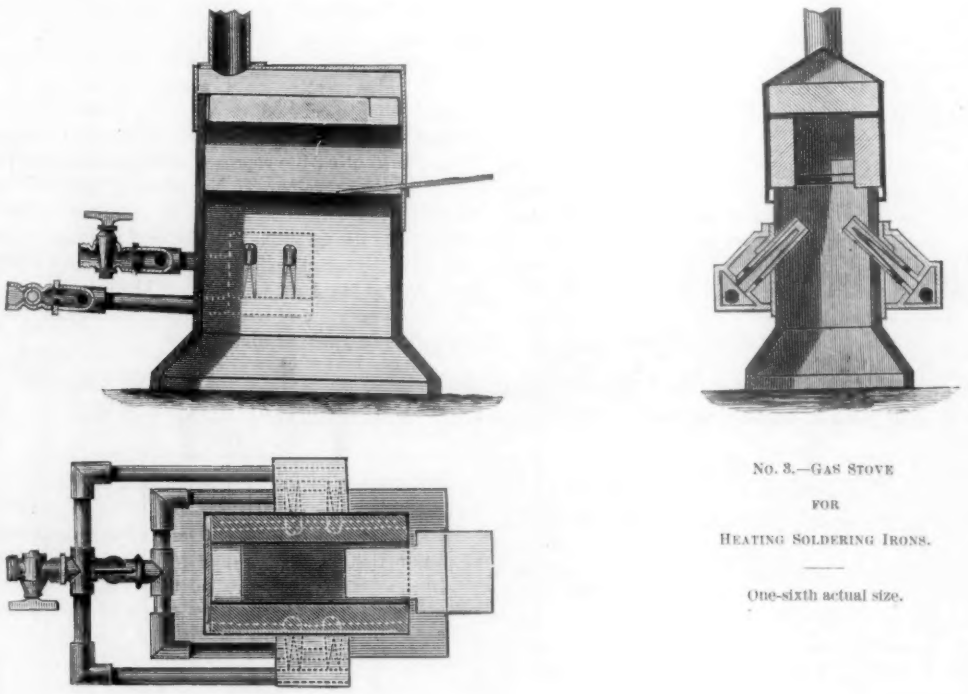
An ulterior advantage of gaseous fuel is that the supply of air necessary for its combustion can be more nicely regulated than with solid fuel; and thus is prevented, to a great extent, the withdrawal of heat by surplus air. This, however, is shared in by generator furnaces, the air supply to which is also largely under control; nor does it appear that in the gas furnaces under consideration any attempt is made to secure economy by limiting the indraughts

of air to the requirements of combustion, and yet the loss of heat is very much less than with solid fuel furnaces. One is led to infer from this that pressure within the furnace contributes to the more economical result, and this derives confirmation from a statement made with regard to Thompson's kiln, that it is found to work economically and efficiently in proportion to the pressure under which the gas is applied. Pressure within the furnace has long been recognized as highly desirable; and the descending syphon tube, by which, in the original Siemens arrangement, the gases are cooled, was devised with the object of securing this. Last year attention was directed to the same point by M. Melon, in the course of an instructive paper contributed by him at the meeting of the Société Technique de l'Industrie du Gaz en France. M. Melon goes so far as to express an opinion that, by the mere application of an air-blast to ordinary furnaces, chimneys would become unnecessary; an evacuating pipe only being required for the spent gases, which would have little if any heat remaining in them. Such a consummation would, it is clear, settle completely and agreeably the question of the employment of the regenerative system; but whether possible of attainment remains to be seen. Certain it seems, however, that pressure promotes absorption of heat, and that the principles of the blowpipe, and of Fletcher's furnaces, is applicable to those larger uses of gas which are now coming to the front.

Waste of heat, such as may be tolerated with solid fuel, is altogether inadmissible, and should, to a large extent, be unnecessary when gas is employed; and for its avoidance pressure is evidently one of the essential conditions. Where it can be conveniently applied, an air-blast fulfills this most perfectly, by promoting concentration of heat with the least possible pressure of gas; a further illustration of the economy of which is afforded by its application to tinmen's stoves (see drawing No. 3), the result being a very appreciable saving of gas, the pressure of the latter not requiring to be more than 5-10ths of an inch.

For purposes for which a more moderate degree of heat is sufficient—as, for example, in cooking and warming—the conditions are dissimilar, but none the less within the range of economical considerations. Cooking stoves, as usually constructed, exhibit a very wide diversity of practice, some of those in most general use, of corresponding dimensions, differing in the consumption required for the same work in the proportion of 1 to 3. This is suggestive of the reflection that if, for a specific purpose, 30 cubic feet of gas are shown to be adequate, any appreciable excess beyond this quantity must be very much more than adequate, and ought to be discountenanced accordingly. Cooking, however, is an art that in many of its phases may be said to admit of a variety of opinions; and probably the manner in which the more extravagant stove performs its work may commend it to the judgment or the fancies of many. There are those who hold that, to roast properly, ample ventilation is essential; and this, when the gas is applied internally, is best secured by admitting the freest possible egress to the products of combustion, although at the cost of a correspondingly heavy consumption. Others, again, are more moderate, desiring—and to all appearances rightly—to maintain only just sufficient draught as will carry away the steam as it rises from the joint; while a damper in the exit flue places a means of economy and of effectual control in the hands of the attendant. As a further aid to economy the regenerative system may be legitimately introduced, though scarcely, as is done in a few instances, by forming an air passage to the burners between the inner and outer casing of the stove. Whatever heat is returned in this way must have been derived by conduction from the interior of the stove, and this conduction it should be the aim of the manufacturer to prevent. Real economy is only to be promoted by recovering heat which would otherwise be lost through the outlet flue. This recovery has been attempted in other ways, such as by warming water; but whatever course be adopted should prove doubly beneficial, inasmuch as the cooling of the spent gases must effectually counteract any undue tendency to draught through the stove.

It is not at all clear that the substitution of an absorptive lining or packing of some non-conducting material for glazed tiles is, in the case of cookers that are internally fired, a step in the right direction; since the object to be aimed at is to render available as soon as possible the whole of the heat as it is produced. This is distinctly defeated in proportion to the retentive property possessed by the material employed; because whatever heat is absorbed by the apparatus at the commencement of its work will be retained until its close. Consequently, the time occupied in heating up, with its attendant consumption, may be regarded as absolutely lost for useful effect; and that such is the practical issue is made clear by actual comparison. In the recent trials at the South Kensington Smoke Abatement Exhibition, the best results, as regards time and gas consumption for heating up, were afforded by a stove of the reflector type, and the next best by one with an interior lining of glazed tiles.



No. 3.—Gas Stove
for
Heating Soldering Irons.

One-sixth actual size.

These observations apply to stoves, whether radiating or otherwise, having their flues placed at or near to the top; but there is another kind of recent introduction, which is deserving of notice on account of the scientific principle upon which the action depends. Advantage is taken of the natural tendency of heat to ascend, and, as it were, accumulate, by placing the flue at the bottom instead of at the top; and thus is set up a resistance to the indraught of cold air, which is so desirable in the interests of economy. This method of construction likewise admits, with less of loss than would otherwise accrue, of the viands being cooked without contact with the products of combustion. With some people this is an essential point, and therefore not unworthy of attention. However little there may be of practical importance with regard to it, without doubt a sensible effect is produced upon viands when cooked in an internally fired stove. This was shown by an experiment that was made at South Kensington, entirely out of curiosity, and without reference to the competition for awards. The four quarters of one sheep were distributed to four typical stoves, and roasted at the same time. When cooked the joints were immediately locked up, and kept for several days. Upon examination, it was found that the joint which had been cooked without contact with the products of combustion was in the best state of preser-

vation; next to it was the one that had been cooked in a reflector stove; the one representing a stove internally fired with air burners ranked third; while in the worst condition was found the one cooked in a stove internally fired with luminous flames. Standing by itself, this experiment cannot be regarded as conclusive; but it is clearly suggestive of further investigation, since it must be undesirable that gas should, in the slightest degree, contribute to deterioration in cooking.

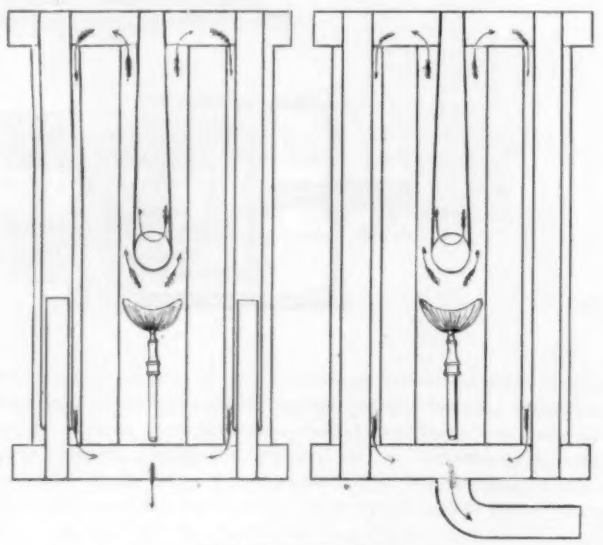
Heating stoves have excited an amount of controversy which, to all appearance, is not yet exhausted. It is impossible for me, within the limits of this paper, to follow with any degree of minuteness the various points at issue; and this is the less desirable, since the law upon the subject has recently been laid down at great length, and, it must be added, with conspicuous ability, by Mr. J. L. Bruce, the Convener of the Committee in connection with the Exhibition of Heating and Lighting appliances held in Glasgow in 1880. It is, however, necessary to offer a few considerations, as from a fairly practicable standpoint.

It has been sought to show that the calorific power of illuminating gas is in danger of being underrated, since successive investigators have placed different and almost uniformly higher values upon its constituent combustible gases; and therefore it is argued that the means alone are wanting for its development to an almost unlimited extent. However disposed one may feel to sympathize with an idea which opens up such a wide range of possibilities, it cannot be advisable to accept it off-hand. It is to be presumed that the eminent investigators who from time to time have turned their attention to this subject satisfied themselves that they obtained perfect combustion in their experiments, and that consequently the whole of the heat derivable from the gases operated upon was evolved. Any difference, therefore, that is observable in their results should be attributable to the comparative accuracy of their means of observation. It matters little whether the gas be a simple one, such as hydrogen, or compound, as carburetted hydrogen; nor whether, as shown by Dr. Adams to be frequently the case, the heat of combustion of a compound is found to differ from that of its elementary constituents. If perfect combustion be assured, then the only element of uncertainty that can exist lies in the means employed for securing and measuring the heat. That this has been reduced to within very narrow limits is proved, on the one hand, by the practical agreement of the most recent authorities; and, on the other, by the circumstance that theoretical perfection has never been reached by ordinary appliances. In point of fact, as was demonstrated by Mr. F. W. Hartley, in his paper read before the Institute last year at Birmingham, and as indeed is patent to all who have had experience on the subject, no approach to it is at all possible under ordinary conditions, even with the greatest possible care.

How is this to be explained? Is imperfect combustion the cause, or are other appliances at fault? Imperfect combustion can be detected by the presence of unconsumed carbon, or carbonic oxide, in the products of combustion. The former is not infrequent when luminous flames are employed, but ought not to occur with a properly regulated burner; while, except in rare cases, such as when the flame is allowed to impinge upon a cold surface, or when an abnormally bad burner is employed, carbonic oxide is an entire stranger. With a properly constructed air burner, therefore, there ought to be perfect combustion, and it was principally with air burners that Mr. Hartley's experiments were made. These showed an appreciable difference between the burners themselves; but this is of less consequence than the average loss of heat realized, estimated at 47 per cent. This loss may be regarded as typical of that which ordinarily prevails when a similar effect is desired. The property of retention of heat of any object naturally diminishes with its rise of temperature, since radiation and conduction become more active; and its power of absorption becomes less until it ceases altogether when equality of temperature between it and the source of heat is attained. Both causes commonly operate to bring about the difference that invariably subsists between the amount of heat applied and that which is utilized.

Mr. Hartley recognizes this when he says that "the higher the temperature to which water is raised . . . the smaller will be the amount of heat realized." This is explanatory, for the most part, of the phenomenon of waste heat as commonly observed. If, instead of raising the water to boiling point, he had operated upon a larger quantity, increasing the temperature by only a few degrees, there is every reason to suppose that his results would have approximated much more closely to theoretical perfection. As it is, his experiments prove very little beyond the almost insuperable difficulty, under ordinary conditions and with ordinary appliances, of preventing waste. It is improbable that, of the heat expended in a gas cooker, more than a very small proportion is actually utilized in cooking the joint; while, ascending the scale of uses, it has been estimated that, of the heat applied to a bed of retorts, only about 11 per cent. is directly absorbed in the process of carbonization.

With regard to gas heating stoves, there is an essential difference. It is to be observed that there is not the necessity for maintaining a high specific, or an accelerated temperature. The volume to be operated upon is also large, and the effect required diffuse. Consequently it is not too much to say, as recently pointed out by Mr. Fletcher, and suggested by myself during last year's meeting of the Institute, that for the end in view—namely, the raising of the temperature of an interior say 20° F.—no apparatus can prove more effective than an ordinary gas burner, ensuring, as it may be made to do, perfect combustion, with satisfactory distribution, and complete realization of the heat evolved. Where, then, is the necessity for a stove, and what are are its legitimate functions? The answer is, that sanitary conditions demand that the air of a room shall be contaminated as little as possible; and modern teaching enforces the necessity with regard to it, of a condition of continual change. Thus a stove is needed, secondarily, to promote an indraught of fresh air from without; but, primarily, as a means of confining, and ultimately conveying away, the products of combustion. It is to all intents and purposes a condenser, or rather cooler of such products; and, speaking broadly, the measure of its efficiency is inversely as the amount of heat expended in finally disposing of them. Obviously, however, this expenditure must vary according to the size and length of the flue employed—a matter of detail that has received little or no attention; it being assumed, apparently, to be one which the user should be at liberty to vary according to circumstances. Mr. Bruce has rendered excellent service by his exhaustive and scientific exposition of the principles that should guide both manufacturer and user in this particular, although his conclusions have not been allowed to remain unchallenged. It is objected that his condemnation of flueless stoves is unnecessarily severe, for the reason mainly that the consumption in them is, if anything, less than that which obtains, in the majority of cases without inconvenience from the products, for lighting purposes. This plea, however, cannot be allowed to prevail at a time, of all others, when special efforts are being made to combine, with improved illumination, the carrying away of the products of combustion, and so to remove from gas lighting the reproach which has so long rested upon it of contaminating the atmosphere. If, therefore, I also find myself at issue with Mr. Bruce, it is not because I differ from him as to the neccessity for a flue. It arises from the fact that there is, as I imagine, a principle discernible in the so-called "condensing" stoves, which, if only recognized and applied, might have spared Mr. Bruce a very considerable amount of trouble in arriving at the due proportion of heat required to carry off the products of combustion with flues of different dimensions.



No. 4.—Condensing Stove.

In No. 4 drawing is shown a "condensing" stove. When in full action no heat is observable at the outlet; the whole of it being utilized in warming the surrounding atmosphere. Consequently the products of combustion cannot be disposed of in the ordinary way—viz., by means of an ascending flue. The arrows show the course taken by the products through the stove, at the bottom of which is a small outlet for draining away the condensed aqueous products, which usually contain a considerable proportion of the sulphur compounds. Toward the bottom of each condensing tube is an annular space, by which the gaseous products—principally carbonic acid and nitrogen—find their way into the inner tubes, and thence into the room. This is very wrong, no doubt; but in its effect for heating purposes I have found such a stove to be the most economical of any in present use, tried under similar conditions. It is almost, if not quite, as efficient as a naked burner, which is the highest compliment that can, according to my view, be paid to any heating stove. But how is the objectionable feature to be got rid of, and the stove rendered as satisfactory from an economical point of

view? Merely closing up the annular spaces will not suffice, for then the carbonic acid is held back and extinguishes the flame; but by enlarging the bottom outlet as well, as is done in stoves of a somewhat similar construction, the whole of the products fall away. All that is then required to conduct them out of the building is a pipe, laid with a fall, and thus we get a flue, but descending instead of ascending; its action depending upon the density of the products instead of upon the expenditure of a certain amount of heat which might be more profitably employed. The products, other than aqueous vapor, to be conveyed away, differ from those of a coal fire in being entirely gaseous. There are no solid products to be got rid of, no carbon in the form of smoke. The aqueous vapor is, it is needless to say, readily condensable, and the remaining products consist chiefly of nitrogen and carbonic acid. Nitrogen at ordinary temperatures possesses a specific gravity of .972, being a very little lighter than air; while the specific gravity of carbonic acid is 1.524, showing it to be more than 1½ times as heavy as air. It is therefore easy, by taking advantage of the natural law of gravity, to promote a draught sufficient to sustain combustion, and take the cooled products clear away. I have tried this plan with descending flues upward of 40 feet in length, experiencing no difficulty whatever; the only difference observable in the modified apparatus being that it requires a somewhat greater extent of cooling surface to perform the same amount of work. I venture to describe this method as one that is based upon a sound scientific principle, and as a practical and economical solution of the flue difficulty. It will probably be found applicable to all the uses of gas, but more especially to those which admit, as in warming and ventilating, of the complete utilization of the heat employed.

In conclusion, I have here endeavored, although with conscious imperfection, to show that illuminating gas, as commonly manufactured, is fully capable of sustaining a dual part, as the only practicable system of gaseous fuel; and that, notwithstanding its comparative costliness, it can be brought within the reach of many of the larger uses of solid fuel. I have likewise sought to indicate some of the directions in which it is probable that further economy in its application may be secured. The subject is, however, not readily exhausted, and it will be apparent that a few only of its most salient features have been reviewed.

The discussion evoked by the paper was of great interest, and was participated in by Mr. F. W. Hartley, H. Woodall, R. Harris, G. Bray, C. Eastwood, G. Livesey, W. Sugg, and others, and we regret our inability to reproduce it in full. In answer to the different questions raised by the discussion Mr. Hunt made the following replies:

Mr. Hunt said Mr. Hartley had somewhat complained that he had assumed that all his (Mr. Hartley's) experiments were made with cold water raised to boiling point. He could only say with regard to this that he had taken the statement in Mr. Hartley's paper, as it appeared on paga 101 of last year's Transactions, as illustrating the point that he desired to elucidate. He was glad to hear that Mr. Hartley's statement with regard to the cost of water gas more than confirmed his own. What he meant by burning gas under pressure was that there should be a pressure within the furnace, whether produced by means of a blowpipe or the arrangement of Mr. Sutherland mattered little. In Messrs. Thompson's kiln the pressure was produced by regulating dampers, which, when partially closed, created a pressure within. Mr. Henry Woodall had misunderstood him in saying that his only complaint against his scheme was on the score of novelty. He had described this rather as a merit, and the objection he urged to it was that of principle. It did not appear to be fair to consumers who burnt gas for trade purposes, but used it for illumination, that they should be placed at a disadvantage as compared with those who burnt it also for trade purposes but not for illumination. If they gave a preference for those who wanted to use gas for gas engines, they should also give a preference to large consumers who used it for illuminating their shops or warehouses. Various speakers had referred to the experiment to which he had alluded as having been made upon the four quarters of a sheep. He had observed in his paper that this experiment standing by itself could not be regarded as conclusive, but rather as indicating the necessity for some further experiments in the same direction. If this tendency to more rapid decomposition was an advantage rather than otherwise, let it be shown to be such; at any rate the matter should be made clear one way or the other, in order that it might go before the public that cooking by gas was advantageous in this respect. They should satisfy themselves in the first place as to whether the effect was as stated; and, secondly, whether it was advantageous or otherwise. Mr. Bray and Mr. Woodall had both made observations with regard to the arrangement of downward flue which he had proposed. He was fully aware that both these gentlemen had been working in the same direction, and so had others; but in their arrangements he had not seen any attempt at carrying off the products of combustion. Mr. Bray was evidently at fault in the matter, for he expressed a doubt as to whether it could be done; whereas he (Mr. Hunt) had simply stated the result of his own experience. He had led such a flue to a considerable length, and discharged the products into the open air; the stove working satisfactorily. This was the best answer he could give. Mr. Livesey had asked if he could name any place where the return for the residuals more than equalized the cost of the coal. He could give him two instances within his own knowledge; but he did not know that he was at liberty to give the details in both cases. In one case he supposed he was, because a gentleman had kindly handed him a paper which he presumed was intended to be read. The cost of coal at Dewsbury was 8s. 6d. per ton, and the returns were—for ammoniacal liquor, 3s. 4d.; tar, 3s. 2d.; coke. 2s. 8d., making a return of 9s. 2d. Mr. Harris had spoken in favor of the regenerative principle as applied to cooking stoves; but he (Mr. Hunt) still adhered to the opinion he had expressed, that to convey air for combustion between the inner and outer casing of the stove was not the correct method of applying this principle. He believed the object to be aimed at by stove makers was to prevent conduction as much as possible. If it could not be prevented, then it was right to take advantage of it, as was done; but the first aim should be to prevent conduction, and to apply the regenerative principle to the heat, which would otherwise be lost.

The President said the paper itself, and the discussion it had aroused, had both been of a very interesting character, especially when it led up to the quality of meat as cooked by an open fire and by a gas stove. He agreed with Mr. Woodall that the meat cooked by a gas stove was more likely to perish after being kept some days, because the juices were retained in it. This was, no doubt, the secret of the whole matter. If it was desired to keep meat, the juicy matters must be got rid of; and must either be frozen or desiccated. If the gravy were left in the meat, and the meat were exposed to the atmosphere, it would perish sooner than if it had the gravy taken out. The use of gas for heating purposes was important, and Mr. Hunt had shown in a very able paper how it might be used. What they all had to do, when they reached home, was to endeavor to enforce its use for heating and cooking purposes.

New Mechanical Stoker.

The London *Journal* states that Mr. G. Rook, of Nottingham, has a proposal for drawing and charging retorts by mechanical means, which is, to say the least, ingenious. The charging machine consists of a drum carrying 3 boxes or scoops in its periphery, in the manner of ordinary elevator scoops. These boxes are mounted on swivels, so that they can be made to stand either tangentially or across the mouth of the edge of the drum. The drum is placed transversely to the mouthpieces of the retorts, and the scoops are permitted to dip in a trough which is kept full of coals underneath the drum. The method of working will now be understood, for as the drum is caused to revolve by any convenient source of power, the scoops successively fill with coals, and as they come opposite the retorts to be filled they are turned half round, and then pushed into the retort and turned over by a ram. The drawing machine consists essentially of a jointed rake, which is made in pieces to lie round an octagonal drum. The drum is revolved by a chain wound round a pulley, and connected to a quadrant which is driven by suitable power. As the drum is revolved in one direction, the rake is unwound and forced forward into the retort, when a revolution in the contrary direction pulls it out again.

One object of the designer of this machinery is to economize retort house space; and he believes that if his apparatus is successful in extended working a great proportion of the floor now required to be kept clear in front of the settings may be utilized in other ways, or be dispensed with in construction. It may be said, however, that there is little difficulty in drawing and charging by the machinery hitherto used for these purposes; the great problem has always been in the convenient application of power.

Adulteration of Cements.

The London *Builder* states that this question is attracting a certain amount of attention in Germany at the present moment. One of the leading technical journals recently published (omitting names) an exact copy of a letter sent to a cement manufacturer offering him a supply of finely-sifted blast furnace cinder for mixing with cement, and citing the fact that this article is regularly supplied to one of the largest manufacturers in Germany. The matter has recently been much discussed in technical and industrial circles, so that a considerable interest was taken in the meeting of the German Cement Maker's Union, which took place on the 6th ult. in Berlin. This assembly was convened, it would seem, for the express purpose of discussing the best means of putting a stop to such adulteration on the part of certain producers.

The meeting was attended by representatives of nearly all the German cement makers, and it is remarked that the deliberations were marked throughout by a friendly spirit, and by a desire to arrive at a solution of a definite and satisfactory nature. Dr Dellbrück, the chairman of the Union,

presided, and it was generally acknowledged that proceedings of the nature referred to on the part of certain manufacturers were calculated to injure the reputation of German cement in both home and foreign markets. It was further argued by some speakers that even if the admixture of certain substances with cement resulted in increasing its strength, yet it was unadvisable to sanction a practice which opened the door to adulteration of a more serious nature. A resolution was at length unanimously adopted (leaving open the question whether the additions of certain substances to cement after burning improved or deteriorated its quality) all such admixtures should be considered as adulterations, and should be treated as such, unless the bags and casks bore a statement that such an admixture existed in their contents. Only such additions as gypsum, etc., necessary for giving certain properties to cement, would be allowed, and then only up to the extent of two per cent. The representatives of the factories which had used the admixture referred to then declared their intention of adhering in future to the principles laid down in the resolution which had been adopted. It was decided to forward to each cement manufacturer in Germany a copy of this resolution, with a request for an expression of the acceptance of the general principle thus laid down. It is proposed to publish, after a lapse of about three months, the names of those makers who shall have refused or neglected to signify their c ncurrence in the policy of the union.

A report is to be presented to the Government giving details of the steps which are being taken to prevent the continuance, on the part of manufacturers, of the adulteration which had called for the action of the central body.

Gas Works in China.

Speaking of the progress of science and mechanics in China, *Engineering* comments as follows upon the outlook for the gas industry in that quarter—

"Gas works are likewise becoming acclimatized in China, and Tientsin and Foochow are just now in a fever of expectation at the prospect of gas works at an early date. Still, it is just possible that the marked advance made by electricity during the past few years may arrest this progress. Capitalists as a rule are too shrewd to advance money for any enterprise which a few years may see largely superseded by a superior system of lighting. Moreover, the present high price of coal in the commercial centers of China, places the gas companies at a terrible disadvantage when competing with their formidable rivals. At existing rates the Shanghai companies have to charge four times as much as in England, and even then their profits are not enormous. This disadvantage will doubtless be removed during the next few years, when the native coal mines come to be worked in earnest.

"In this place it may be well to allude to the kindly disposition displayed by the Chinese in regard to lighting arrangements. Although naturally too poor as a rule to avail themselves of gas (at $3.50 per thousand feet) they have from the very first appreciated the great advantages possessed by Western methods. Both the Shanghai Gas Company and La Compagnie du Gaz, a French undertaking, were popular with the provincial authorities, meeting with official support from their earliest conception. Commercially, as well, both have proved fortunate, the Tes 100 shares being in each case quoted at over 50 per cent. premium. More notable still, the Kaiping coal mines, 60 miles N.N.E of Tientsin are illuminated with gas supplied from gasometers actually constructed at the company's workshops."

Naphthaline.

By Dr. Gustave Schultz.

The *Scientific American* contains a report of a lecture on this subject, by Dr, Gustave Schultze, Inspector of Chemistry at the University of Strasburg. We extract the following:

Its Preparation from Coal.—Before taking a survey of the naphthaline industry of the present, let us briefly consider the method by which the hydrocarbon is separated from the coal tar, and purified. The tar is first distilled in wrought iron boilers, which are provided with covers and pipes to carry off the vapors, which are carefully cooled and collected.

First come over low boiling oils and ammoniacal water; next follows the "light oil," called so because it floats on the water; then a product which sinks in water, and hence called "heavy oil." A portion of the latter solidifies to a buttery mass of a green color. This is very valuable because it contains anthracene, the starting point in making artificial alizarine, and hence also called anthracene oil. The residue remaining in the kettle is drawn off, and when cold forms a brilliant black pitch, used under the name of artificial asphalt for street pavement, for making pipes, and numerous other purposes.

The latter portion of the light oil and the earlier portion of the heavy oil furnish the material from which naphthaline is made. When this product is cool, the naphthaline gradually separates and is freed from the oily contaminations by filtering and pressing out. Since the hydrocarbon always contains basic and acid bodies, they are to be removed by sulphuric acid and caustic soda lye. Finally, the purified substance is subjected to distillation or sublimation, when it is obtained in a pure white condition.

[Here follows a description of a few of the materials which are obtained, and the uses to which they are put.]

Naphthaline Dyes.—All these uses are, however, insignificant, both in quantity and multiplicity, in comparison with its use in making dyes, for which purpose several thousand kilogrammes are used daily. The reds are the chief dyes made from naphthaline, but yellows and blues are also produced.

Among the former, especially, are the numerous eosine, and the azo-dyes which are so abundant in the trade, and by their excellence threaten to supplant cochineal, just as artificial alizarine from the anthracene of coal tar has crippled the madder industry, which a few years ago was so flourishing in southern France.

It is worthy of remark that these artificial dyes made from naphthaline were not discovered "by chance," but are the result of extensive investigations. This again shows what an advantage it is to science and to industry when theory and practice go hand in hand, and mutually aid and sustain each other. While science is aided by industries that furnish her with materials to investigate, she, on the other side, points to valuable methods of utilizing discoveries, and of making use of what would otherwise be waste products. Thus she had indicated rational uses for naphthaline that had formerly been an almost useless product of the aniline color industry, which was only in the way, and a nuisance.

With the entrance of naphthaline into the circle of other coal tar products which can be converted into magnificently colored substances, we approach the fulfillment of the hope of those enthusiasts who would celebrate, in the artificial dyestuffs from coal tar, the resurrection of the colors of the flowers of an early vegetation now submerged and converted into coal.

Lighting the Harbor of Bilbao.

It is stated that a scheme for lighting the port and harbor of Bilbao, Spain, is now awaiting the sanction of the authorities.

It provides for the establishment of forty lights, each of 2000 candle power, supplied by two engines, and the work of construction is calculated to cost in the neighborhood of $15,000, while the annual cost of maintenance is not expected to exceed $2,000.

Correspondence

[The Journal is not responsible for the opinions expressed by correspondents.]

Gas Purification.

Engineer's Office, Indianopolis Gas Lt. and Coke Co.,
Indianapolis, Ind., August 15, 1882.

To the Editor American Gas Light Journal:

I observe, in the *Journal of Gas Lighting*, of July 18th, that Mr. James Walker, of Leeds, has patented a process of gas purification which consists in mixing fine breeze with slaked lime as prepared for use in dry purifiers. I think it is right to state that there is nothing original in this process. Ten years ago I mixed breeze and slaked lime together, in definite proportions, and used the mixture so prepared in my purifiers.

I had two objects in view, one to save lime, and the other to reduce the back pressure, which objects were accomplished. It never occurred to me then that there was anything original in the idea, or that it was worth a patent, nor do I think so now.

Yours, very truly,
Jas. Somerville.

Quick Work.

Office of Lebanon Gas Light Company,
Lebanon, Ohio, Aug. 19, 1882.

To the Editor American Gas Light Journal:

A short time since we had the misfortune to have our retorts crushed and our holder swept away by flood, from a broken canal reservoir up-town, and we were suddenly left in darkness; but we did not await the rebuilding of holder for light, as Mr. John Anderson, of Taylor & Anderson, gas retort manufacturers of Cincinnati, Ohio, came to our assistance with a couple of benches of threes, both of which he had set within five days of date from shipment; had fire under one bench within three days; and made gas on the seventh day from shipment.

He connected the inlet and outlet pipes in the tank, providing a couple of escape valves to control the pressure, and, by regulating our charges as he directed, we have no difficulty in lighting the city.

Yours,
W. F. Eltzroth.

THE AMERICAN
GAS LIGHT JOURNAL

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Manager—C. E. SANDERSON.

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SATURDAY, SEPTEMBER 2, 1882.

Utilizing Liquid Carbonic Acid.

Krupp, the great gun manufacturer, is said to be employing at his works a very ingenious way of recovering the coils of guns which have become useless. He heats the barrel to redness, and then introduces liquid carbonic acid. The cold thus produced causes shrinkage, and allows the coils to be removed.—*Druggists' Circular.*

PLUMBERS' CEMENT.—Black resin, 1 part; brick dust, 2 parts. The brick dust should be finely powdered, thoroughly dried, and added to the resin when the latter is in a melted state.—*Exchange.*

Gas Stocks.

Quotations by G. W. Close Jr., Broker and Dealer in Gas Stocks.
(with W B Scott & Co.,)
34 PINE STREET, NEW YORK CITY.

SEPTEMBER 2, 1882.

☞ All communciations will receive particular attention
☞ The following quotations are based on the par value of $100 per share.

Gas Co.'s of N. Y. City.

	Capital.	*Par.*	*Bid.*	*Asked*
Central	$466,000	50	75	85
Harlem	1,800,000	50	97	100x
" Bonds	170,000			103
Manhattan	4,000,000	50	220	225
Metropolitan	2,500,000	100	180	185x
" Bonds	658,000	..	107	110
Mutual	5,000,000	100	98	102
" Bonds, go'd.	900,000	1000	100	104
Municipal	1,500,000	100	190	195
" Bonds	750,000		106	110
New York	4,000,000	100	117	120
Northern	270,000	50	—	100
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	107	112
Citizens	1,200,000	20	68	70
" S. F. Bonds.	320,000	1000	105	107
Fulton Municipal	3,000,000	100	75	80
Peoples	1,000,000	10	40	45
" Bonds	290,000	.	104	107
" "	250,000	...	78	90
Metropolitan	1,000,000	100	68	70
Nassau	1,000,000	25	50	55
" Ctfs.	700,000	1000	93	96
Williamsburgh	1,000,000	50	57	60
" Bonds	1,000,000	...	100	101
Richmond Co., S. I.	300,000	50	70	75
" Bonds	40,000	—	—	—
Out of Town Gas Companies.				
Buffalo Mutual, N.Y	750,000	100	—	75
" Bonds	200,000	1000	95	100
Citizens, Newark	918,000	50	—	—
" " Bds.	124,000	—	105	10
Chicago Gas Co., Ills			125	—
Cincinnati G. & C. Co.			178	180
Consolidated, Balt.			42	43
Bonds			107	—
East Boston, Mass	220,000	25	122	128
Hannibal, Mo	100,000	100	95	100
Hartford, Conn	700,000	25	140	144
Halifax N. S	400,000	40	148	150
Hamilton, Ontario	150,000	40	117½	
Jersey City	750,000	20	155	160
Jacksonville, Ill	120,000	50	100	...
Lewistown Maine	400,000	100	—	100
Laclede St Louis Mo.	1,200,000	100	117	—
Montreal, Canada	2,000,000	100	168	170
New Haven, Conn		25	132	—
Oakland, Cal			32	33
Peoples, Jersey City		...	75	80
" " Bds.			...	...
Pittsfield, Mass			120	130
Rochester, N. Y.		50	70	80
Wilmington, Del.		50	174	...
Yonkers		50	30	32
St. Louis Missouri.	600,000	50	250	254
San Francisco Gas-Co., S. Fr'isco Cal.			68	69
Toledo, Ohio			95	97
Troy, Citizens	600,000	100	—	—
Washington, D. C	1,500,000	20	185	200
" Scrip	375,000	15	200	206

Advertisers Index.

Page

GAS ENGINEERS.

William Farmer, New York City ... 126
G. Warren Dresser New York City ... 118

GAS WORKS APPARATUS AND CONSTRUCTION.

James R. Floyd, New York City ... 123
T. F. Rowland, Greenpoint, L. I. ... 123
Delly & Fowler, Phila., Pa ... 123
Kerr Murray Mfg. Co., Fort Wayne, Ind ... 123
Stacey Mfg. Co., Cincinnati, Ohio ... 123
Bartlett, Hayward & Co., Baltimore, Md ... 123
P. Munzinger, Phila., Pa ... 123
Morris, Tasker & Co., Limited, Phila., Pa ... 123
Davis & Farnum Mfg. Co., Waltham, Mass ... 118

GAS AND WATER PIPES.

A. H. McNeal, Burlington, N. J ... 122
Gloucester Iron Works, Phila., Pa ... 122
R. A. Brick, New York City ... 122
James Marshall & Co., Pittsburgh, Pa ... 122
R. D. Wood & Co., Phila., Pa ... 122
Warren Foundry and Machine Co., Phillipsburgh, N. J ... 122
Mellert Foundry and Machine Co., Reading, Pa ... 122

SCRUBBERS AND CONDENSERS.

G. Shepard Page, New York City ... 194
Jas. R. Smedberg, New York City ... 120

RETORTS AND FIRE BRICK.

J. H. Gautier & Co., Jersey City, N. J ... 120
B. Kreischer & Sons, New York City ... 120
Adam Weber, New York City ... 120
Laclede Fire Brick Works, St. Louis, Mo ... 120
Brooklyn Retort and Fire Brick Works, Brooklyn, N. Y. ... 120
Borgner & O'Brien, Phila., Pa ... 120
Gardner Brothers, Pittsburgh, Pa ... 120
Henry Maurer, New York City ... 120
Evens & Howard, St. Louis, Mo ... 120
Chicago Retort and Fire Brick Works, Chicago, Ills ... 120
Taylor and Anderson, Cincinnati, Ohio ... 120

DIETERICH'S REGENERATOR FURNACE.

Charles F. Dieterich, Baltimore, Md ... 104

GAS METERS.

Harris, Griffin & Co., Phila., Pa ... 126
American Meter Co., New York and Philadelphia ... 119
The Goodwin Gas Stove and Meter Co., Phila. Pa ... 127
Helme & McIlhenny, Phila., Pa ... 127
Maryland Meter and Mfg. Co., Baltimore, Md ... 126

GAS STOVES.

American Meter Co., New York and Philadelphia ... 127

VALVES.

Ludlow Valve Manufacturing Co., Troy, N. Y ... 125

EXHAUSTERS.

P. H. & F. M. Roots, Connersville, Ind ... 121
Smith & Sayre Manufacturing Co., New York City ... 121

GAS COALS.

Penn Gas Coal Co., Phila., Pa ... 125
Perkins & Co., New York City ... 124
Cannelton Coal Co., New York and Philadelphia ... 125
New York and Cleveland Gas Coal Co., Pittsburgh, Pa ... 125
Newburgh Orrel Coal Co., Baltimore, Md ... 125
Despard Coal Co., Baltimore, Md ... 125
Fort Pitt Gas Coal, Pittsburgh, Pa ... 124
Chesapeake and Ohio R.R Coal Agency, N. Y. City ... 125

GAS ENGINES.

Schleicher, Schumm & Co., Phila., Pa ... 104

STREET LAMPS.

J. G. Miner, Morrisania, New York City ... 118

PURIFIER SCREENS.

George D. Cabot, Lawrence, Mass ... 94

BURNERS.

G. Gefrorer, Phila., Pa ... 118
The Goodwin Gas Stove and Meter Co., Philadelphia, Pa. ... 128

PURIFYING MATERIAL.

Connelly & Co., New York City ... 121

STEAM BLOWER FOR BURNING BREESE.

H. E. Parson, New York City ... 94

PROCESSES.

Gwynne Harris New York City ... 122
Strong Gas and Fuel Co., Yonkers, N. Y. ... 118

GAS FIXTURES.

Mitchell, Vance & Co., New York City ... 121

CEMENT.

F. O. Norton, New York City ... 121

BOOKS.

Economy of Gas as a Fuel ... 194
Gas Analyst's Manual ... 125
Scientific Books ... 122
Cathels' Gas Consumers' Manual ... 127
Fodell's Book-Keeping ... 127
Review of Gas and Water Engineering ... 127

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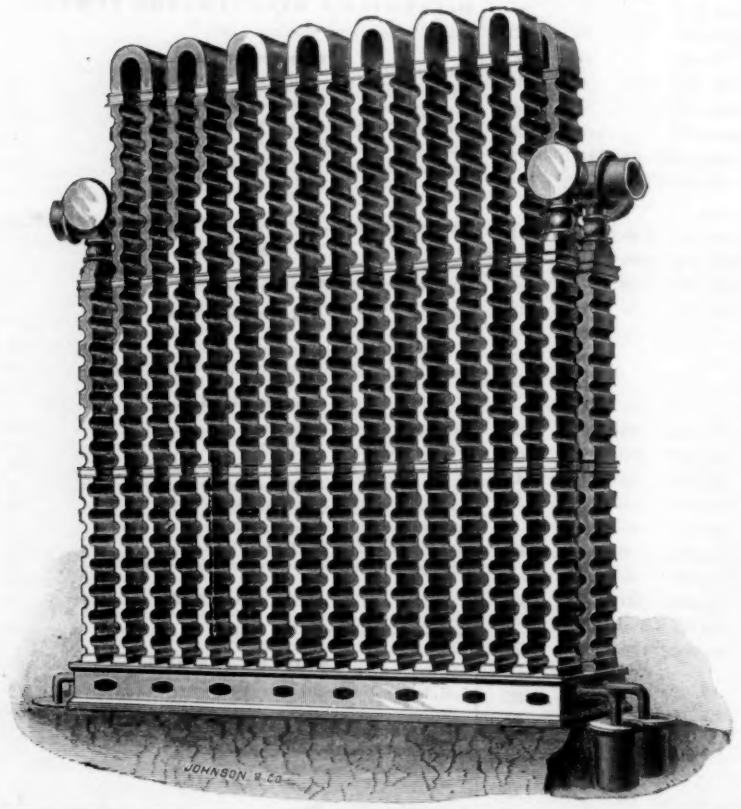

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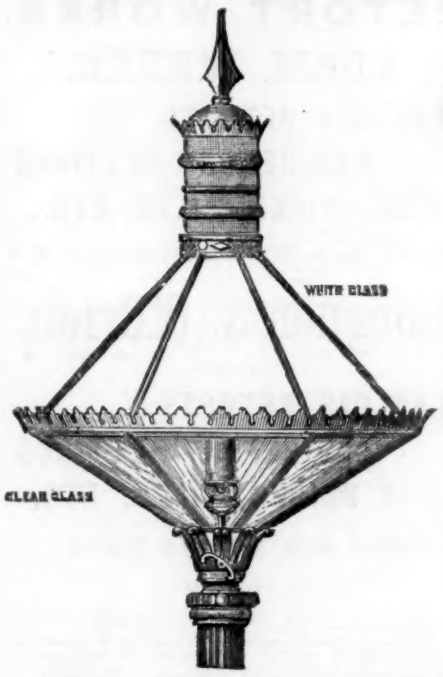

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C (21 ")	14	JJ (38 ")	30½
D (24 ")	16	K (42 ")	31
E (27 ")	18	KK (42 ")	34
F (30 ")	20	NN (75 " 2 rings)	50
G (33 ")	24	100 Candles (2 rings)	100
GG (33 ")	25½	200 " (3 ")	200
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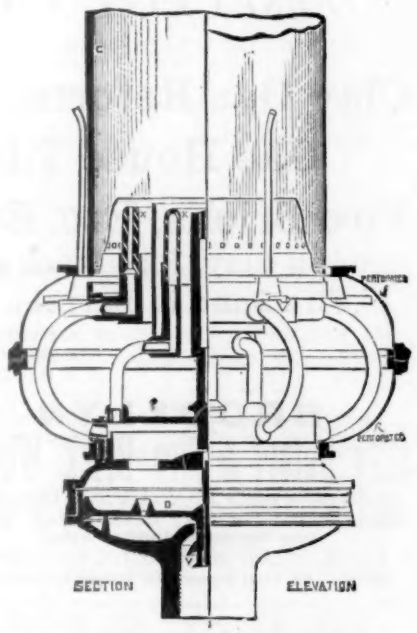

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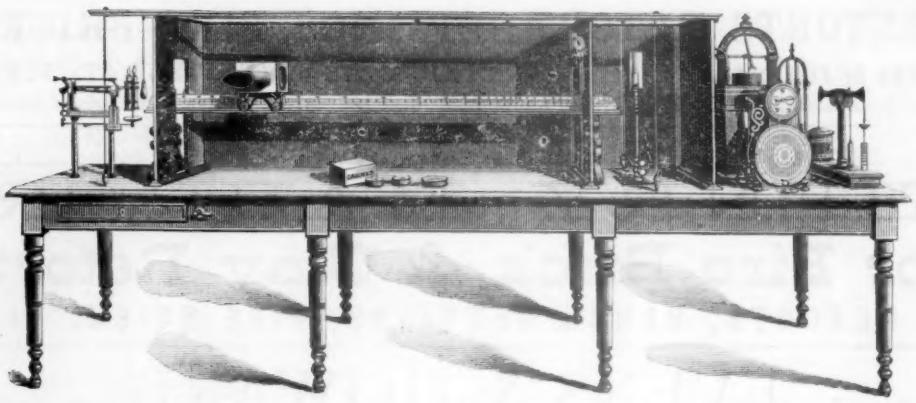

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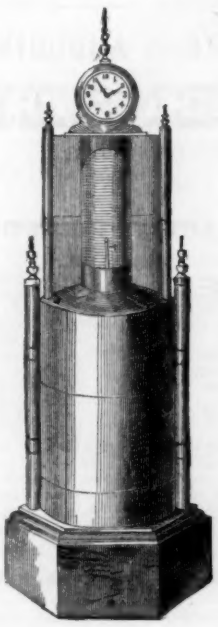

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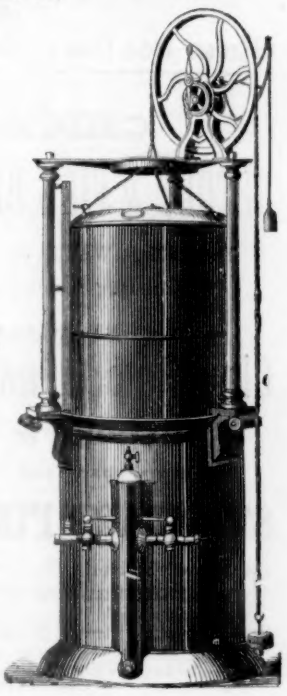

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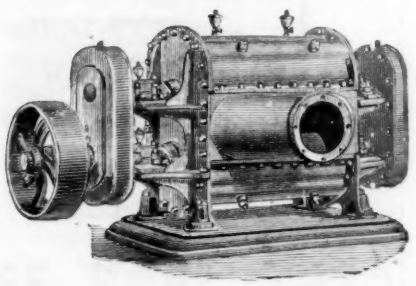

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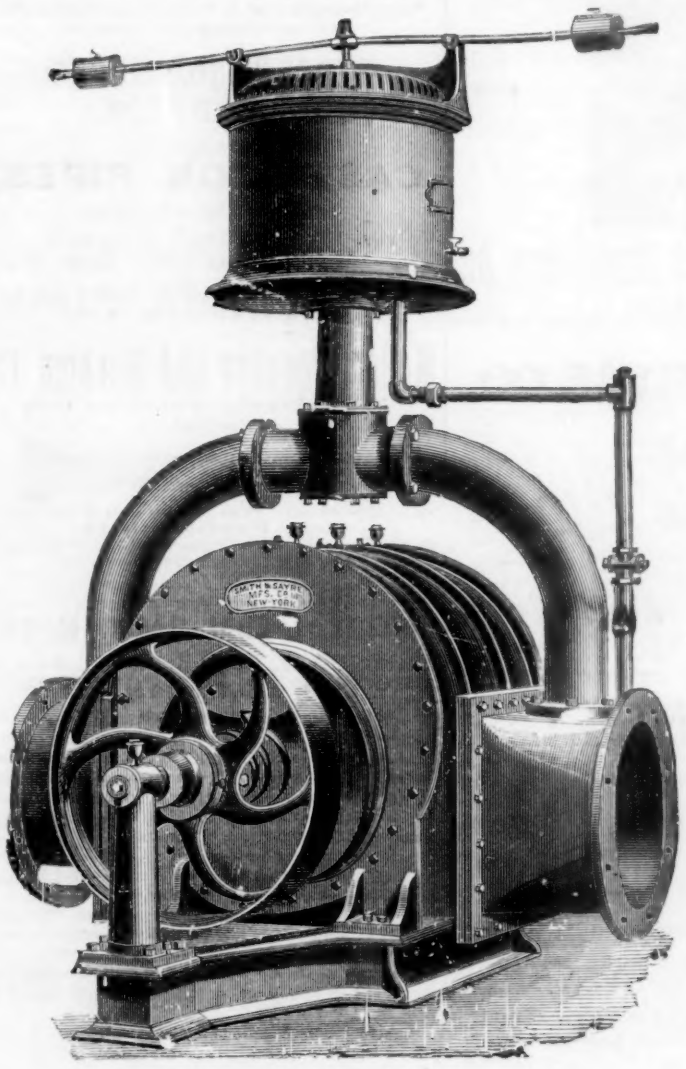

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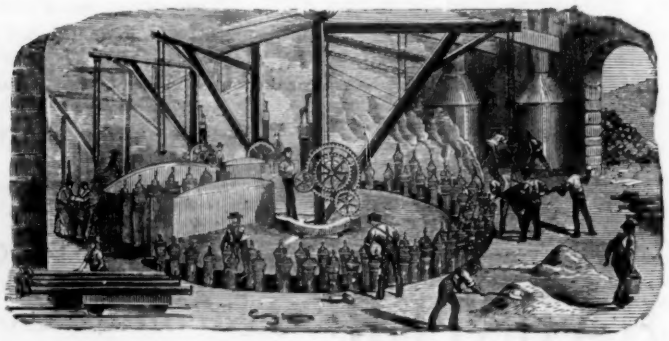

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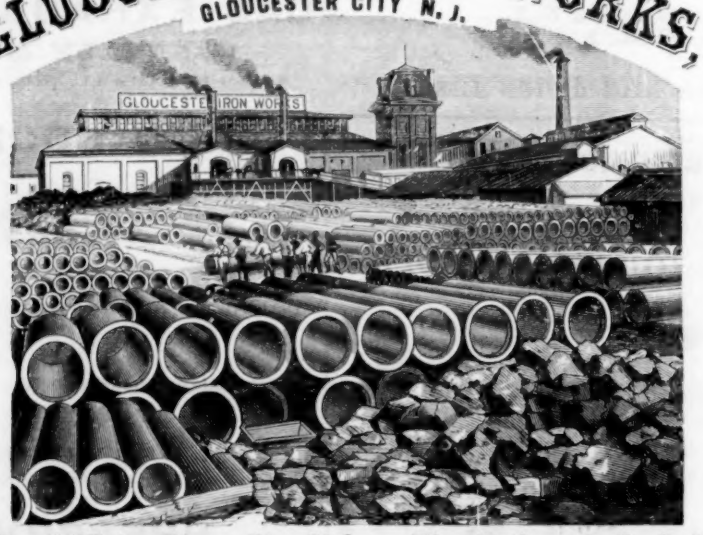

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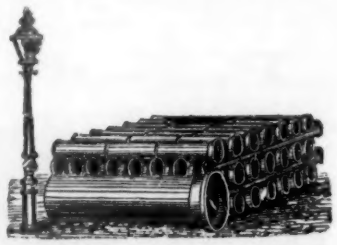

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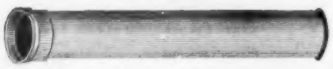

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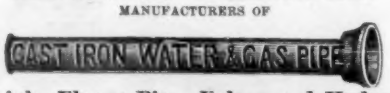

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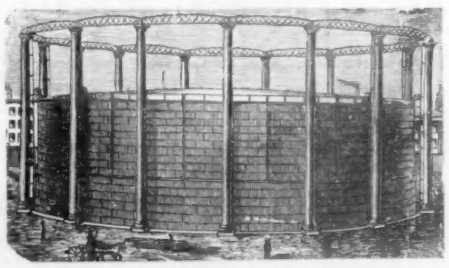

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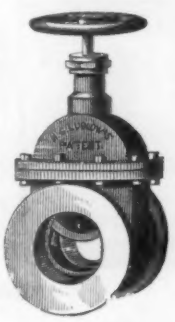

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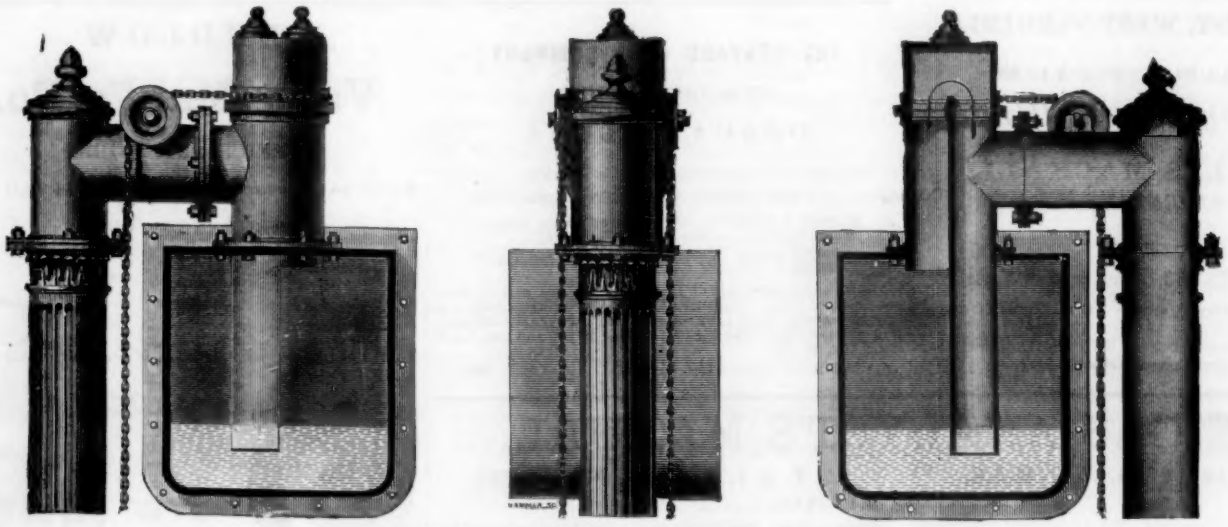

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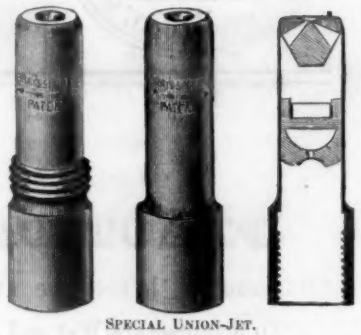

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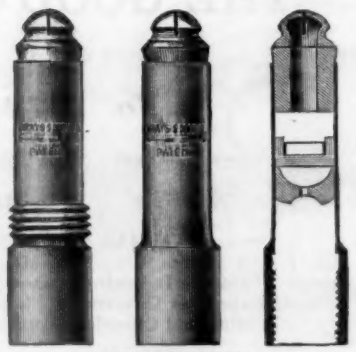

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Description of Burner.	Pressure at points of ignition.	Actual consumption of gas per hour.	Illuminating power in candles at rate of actual consumption.	Illuminating power in candles, at rate of 5 cu. ft. per hour.	Value of one foot of gas in terms of standard candles.
	Inches.	Cubic Feet.	Candles.	Candles.	Candles.
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" Special Slit-Union No. 7.....	.50	4.74	19.20	20.25	4.05
" " " No. 6.....	.50	4.10	16.61	20.25	4.05
" " " No. 5.....	.50	4.24	16.97	20.01	4.00
" " " No. 4.....	.60	3.49	12.58	18.02	3.60
" " Union Jet No. 7.....	.50	4.84	19.13	19.76	3.95
" " " No. 6.....	.55	4.32	17.10	19.79	3.95
" " " No. 5.....	.60	4.14	15.65	18.90	3.78
" " " No. 4.....	.55	3.38	12.04	17.81	3.56
" Regulator Union Jet No. 7.....	.50	4.99	17.69	17.72	3.54
" " " No. 6.....	.50	5.18	17.63	17.01	3.40
" " " No. 5.....	.60	4.37	13.71	15.68	3.13
" " " No. 4.....	.60	3.97	11.46	14.43	2.88

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